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TECHNICAL MANUAL

INSTALLATION MASTER PLANNING

HEADQUARTERS, DEPARTMENT OF THE ARMY

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INSTALLATION MASTER PLANNING

* This manual supersedes TM 5-803-1, dated 5 November, 1970 (formerly designated Installations Master Planning Principles and Procedures).

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CHAPTER 1
INTRODUCTION

1-1. Purpose

Master planning is a continuous analytical process which involves evaluation of factors affecting the present and future physical development of an installation. This evaluation forms the basis for determination of development objectives and planning proposals to solve current problems and meet future needs. Each step or element of the process builds upon the preceding step, providing a logical framework for the planning effort. The product of this process is a series of interrelated documents which together comprise an installation Master Plan. One of these documents is the Master Plan Report The Master Plan Report provides a concise, comprehensive definition of planning proposals, as well as a record of the analytical process and rationale by which these proposals were developed. The purpose of this manual is to provide the appropriate guidance to prepare the Master Plan Report.

1-2. Scope

The criteria and guidance in this manual apply to the preparation of Master Plan Reports for the U.S. Army Installations in the United States. its territories and possessions. and overseas.

1-3. Components of an installation master plan

a. The series of documents which together comprise the Installation Master Plan form an official statement

a. The series of documents which together comprise the Installation Master Plan form an official statement of an installation's long-range plans. These documents are a source of information on existing conditions and requirements for individual facilities and activities at an installation (see AR 2 10-20). A brief description of each document is presented below to establish the position of the Master Plan Report in relationship to these other planning documents.

(1) *Existing Condition Maps* provide accurate and current information about the layout and physical conditions of the installation and are a primary source of information for the Master Plan Report

(2) The *Master Plan Report* is a written record of existing operational and environmental conditions at the installation and the planning rationale used to determine the installation's long-range goals and objectives. The primary products of the Master Plan Report are Land Use. Circulation and Utility Semite Plans which accommodate an installations existing and long-range operational requirements. The planning process used to prepare the Master Plan Report is summarized on figure 1-1. This process involves data collection and analysis which leads to development of concept plans and finally to definition of long-range plans for the physical development of the installation. The Master Plan Report draws information from previously prepared Master Plan documents. and in turn provides the rationale and framework for preparation of other planning studies and documents. Chapters 2 through 4 of this manual describe the process to be followed in preparing the Master Plan Report.

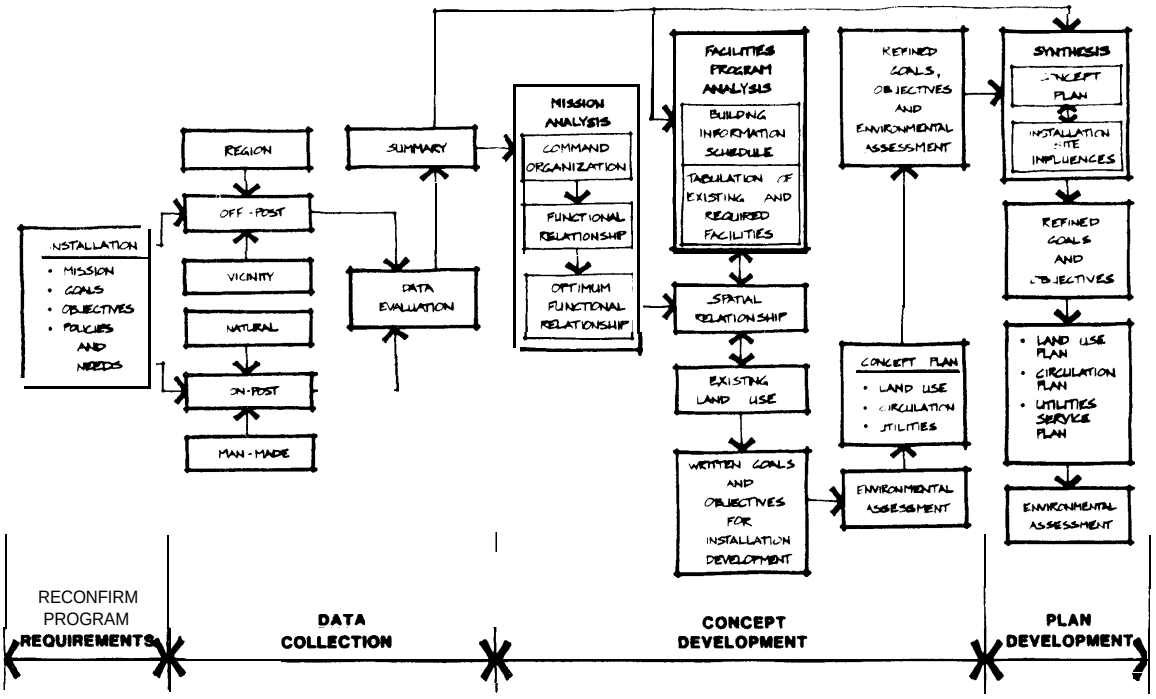

Figure 1-1. Planning process for the Master Plan Report

(3) The *Tabulation of Existing and Required Facilities (TERF)* also serves as a planning aid in preparation of the Master Plan Report, The TERF is an inventory of existing and long-range facility requirements corresponding to the installation's mission and reflected in the Future Development Plans.

(4) *Future Development Plans* are a series of standard size sheets (28 X 40 inches between trim lines) prepared in accordance with TB ENG 353. These plans graphically portray the installation's peacetime develop ment in a logical and efficient manner. The information shown supports the long-range goals and objectives of the Master Plan Report. Future Development Plans include, but are not limited to

- Regional Area.
- Installation Land Use.
- Building Area Land Use.
- Site Map.
- Tree Cover.
- Roads and Railroads.

The Future Development Site Map shows the location of all existing and required facilities in accordance with the land use recommendations of the Master Plan Report Chapter 6 describes the procedure to be followed in preparing the Future Development Site Map based upon planning proposals of the Master Plan Report.

(5) The *Project Phasing Map* depicts the installation's five- year construction program in relation to an overall future facilities' site plan. It is based on the Future Development Plans. The procedure for preparing the Project Phasing Map is described in chapter 7.

b. *Contributing plans* which address specific issues related to an installation's future development are sometimes required. Studies of this nature generally provide greater detail and require a more concentrated analysis of a particular subject. Though prepared separately from other Master Plan documents. contributing plans do become part of the Installation Master Plan. Examples of contributing plans include:

- Installation Compatibility Use Zone (ICUZ) noise studies.
- Military Traffic Management Command (MTMC) studies.
- – Visual enhancement studies.
- Fish and wildlife management plans.
- Historic preservation plans.

Certain contributing plans are required by AR 210-20. Others may be prepared in response to needs defined by the installation or the Major Army Command (MACOM). Guidance for preparation of these special plans is generally provided by a technical manual or bulletin addressing that specific topic. However. the process which is followed is similar to the master planning process described in this manual. Review of recommendations from previously prepared special studies and plans will identify corrective actions and additional facilities needed to meet future development requirements. Pertinent recommendations from these plans should be incorporated in the Master

Plan Report. In developing the Master Plan Report. a potential need for one or more such special studies maybe identified. When applicable. a brief description of this need and the issue to be addressed should be included in a relevant section of the Master Plan Report

1-4. Use of this manual

a. This manual is to be used in conjunction with AR 210-20 to prepare the Master Plan Report- The Master Plan Report is prepared in a logical series of steps and the following chapters of this manual describe these steps in the order in which they are usually taken. Figure 1-2 illustrates the relationships between the Master Plan Report itself. the chapters of this manual. and the planning process.

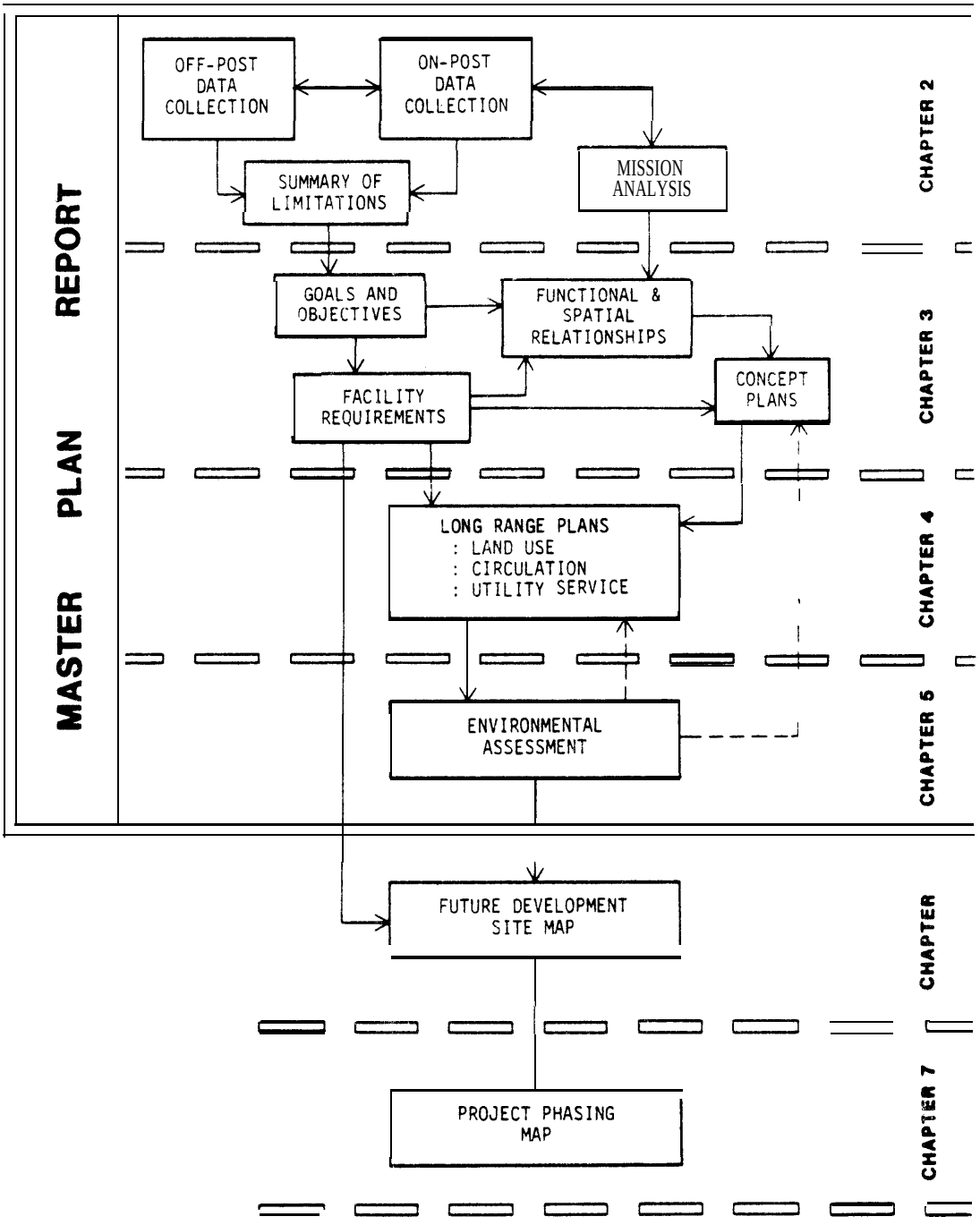

Figure 1-2 Relationship between the Master Plan Report and the planning process.

b. As figure 1-2 illustrates. the process begins with data collection and analysis. Data are collected and studied to determine existing operational and physical conditions and to identify on-and off-post planning limitations. These data are then evaluated to determine their potential influence on the installation-s future development Chapter 2 describes what data are needed and how they are analyzed. Following data collection and analysis. a Concept Plan is developed as described in chapter 3. The Concept Plan provides a theoretical framework toward which installation planning efforts should be directed. The Concept Plan is then further refined to create the long-range plan for overall installation development. The long-range plan includes as a minimum Land Use. Circulation. and Utility Service Plans. Chapter 4 describes how these plans are developed to address specific areas on the installation while still retaining the essential functional and spatial relationships of the Concept Plan. Potential impacts resulting from future installation development are identified in the environmental assessment section of the Master Plan Report. Chapter 5 describes how this asessment section of the Master Plan Report. Chapter 5 describes how this assessment is based on planning proposals on an installation-wide basis. rather than on individual. site-specific projects.

c. Chapters 6 and 7 provide guidance for the preparation of the Future Development Site Map and the Project Phasing Map. respectively. As figure 1-2 indicates. the Future Development Site Map and the Project Phasing Map are not included in the Master Plan Report itself. However. these two elements are necessary steps to bridge the gap between the plan documented in the Master Plan Report and individual site development plans.

CHAPTER 2
DATA COLLECTION AND ANALYSIS

Section L GENERAL PROCEDURES

2-1. Process

Data collection and analysis are sequential steps. Three major types of data are collected and analyzed off-post data on-post data, and mission requirements. The process begins with an initial compilation of information covering a broad range of conditions. Analysis of this information identifies specific needs and significant constraints to meeting those needs. These opposing factors-needs and constraints— are then further analyzed to identify potential improvements which are responsive to both. For a proper synthesis to occur. data collection and analysis must be thorough.

2-2. Data gathering methods

a. Collection of data about existing and projected conditions at an installation is the initial step of the planning process and becomes the foundation for subsequent steps. Therefore, while data collection must be thorough and accurate, emphasis should be placed on obtaining information which is relevant to the installation's future operation and development.

b. Sections II and 111 below indicate initial data sources. Also, sources used for previously prepared plans and related documents will provide data. Review of initial data sources can result in identification of other sources of information to supplement or replace data items in the original requirement listings. Additional sources of information discovered during the data collection process may be important in the overall planning process.

c. Potential data sources which should be investigated include the previous Master Plan Report for the installation and other installation plans and studies dealing with related areas such as utilities, traffic, and environmental conditions. The Basic Information Maps prepared for each installation also provide initial information on the existing physical environment at the installation. Where data are not current, they still may provide a basis for comparison with current information to establish trends.

d. To be useful throughout the planning process. information must be properly compiled and organized so that comparisons can be made between related items. Data should be accessible to both present and future users. with sources and applicability clearly recorded. The format in which information is organized should allow data items to be easily updated to reflect changed conditions.

e. The data will provide a permanent record of the information on which the plan is based. Therefore, a copy of all maps and other documents obtained from all sources should be retained with notations of the source and date prepared. Where appropriate. a document should be accompanied by a memorandum describing any particular application or limitation of the data which it contains. For each on-post or off-post agency contacted. a file memorandum should identify the agent y contacted and summarize the results of the contact.

f. Planning data can be presentcd in one of several formats and information from several sources can be organized in one data format for comparative purposes. Data on physical conditions can be recorded on a series of maps or overlays. These maps should be prepared with a consistent geographic base. either at the vicinity or installation level. Numeric information. particularly comparative data. should be recorded in tables or charts wherever possible. The data presented in these graphic and tabular materials will become part of the working documents for the analysis and evaluation of on-and off-post conditions.

2-3. Procedures for data analysis

a. Data analysis will determine the significance and impact of existing and projected conditions on future development at the installation. Initially, the evaluation will encompass a broad range of conditions. However. the process of evaluation will result in identification of those particular conditions which are of greatest concern to the installation in terms of development direction. The evaluation process will further define how those conditions affect future development and how improvements can be made to meet future needs.

b. The process for each of the data areas will follow a sequence leading from an initial review of collected data to a description of a potential response to identified problems or needs. The evaluation process includes the following steps:

- Review of information on existing conditions.
- Comparison of data with evaluation criteria.
- Definition of significant existing problems identified from comparison of existing conditions to evaluation

criteria.

Identification of projected changes in activity or mission at the installation or future needs which could affect the at the installation or future needs which could affect the use or condition of facilities.

- Determination of constraints that will affect existing conditions or future needs.

- Development of a composite of the relationship between existing and projected conditions and other installation elements and systems (such as transportation) to determine possible impacts.

- Identification of potential alternatives to resolve problems or meet installation needs.

c. Data analysis covers a broad range of on-and off-post conditions. General criteria which provide overall standards for information evaluation at the installation include:

-- Operational efficiency, particularly time-distance relationships between various functions.

- Ability of the existing development pattern to adapt to change.

- Ability of existing installation facilities to be expanded or reused.

- Opportunities for conservation of renewable resources.

- Environmental safety of military personnel. dependents. and employees.

- Degree of harmony between natural and man-made features.

- Compatibility between the installation and the surrounding community.

- Significant natural features which should be preserved.

- On-post areas particularly well suited for development or redevelopment.

- Capacity of installation facilities to adequately support the existing and projected mission.

d The principal findings from the analysis of existing conditions will also be documented to become part of the Master Plan Report Significant factors affecting future development should be clearly presented. These factors will affect the remainder of the planning process.

Section II. OFF-POST INFRASTRUCTURE AND COMMUNITY INTERFACE

2-4. Data Sources

Off-post data collection and analysis are needed to identify regional and vicinity conditions which affect the installation. Off-post data sources will vary, depending upon the installation. Off-post data sources will vary, depending upon the installation's location and the organization of state and local government agencies, or corresponding governmental agencies in foreign countries. Initial contact with such data sources as regional and municipal planning agencies usually provides the identity of other likely sources. Some basic sources of off-post data are listed in table 2-1. The remainder of this section describes the types of off-post data to be evaluated.

Table 2-1. Sources of off-post data.

Federal Agencies:
- Bureau of the Census
- National Weather Service
- Environmental Protection Agency
- Federal Aviation Administration
- Soil Conservation Service

Local Government Offices:
- Public Works
- Public Health
- Parks and Recreation
- School District
- Planning Department

State and County Departments:
- Highways and Transportation
- Natural Resources and Conservation
- Planning and Community Affairs
- Aeronautics
- Environmental Protection and Pollution Control
- Housing
- Public Health

Other Local Agencies:
- Utilities and Power Companies
- Chamber of Commerce
- Regional Planning Agencies

2-5. Geographic location

The installation's physical relationship to regional and local Jurisdictions may affect the potential for change and growth at the installation. This relationship should be examined in terms of regional conditions and trends and also in terms of more specific local factors in the immediate vicinity of the installation.

a. Region. The outstanding characteristics of the region should be shown on an exhibit titled "Regional Setting"'. This exhibit is to be included in the Master Plan Report Figure 2-1 gives and example of a Regional Setting exhibit This exhibit should illustrate an area of 100 square miles surrounding the installation and should include the following information: general location of the

region within the state; location of the installation within a regional planning jurisdiction or a Standard Metropolitan Statistical Area (SMSA); the relationship of the installation to principal cities in the region; major transportation facilities in the region (highway, airfield, waterways); and the installation's location in relation to other major Federal installations. In addition to preparing this exhibit, regional plans should be analyzed. The area of regional analysis may be smaller than shown in the Regional Setting exhibit but should include at least the country or counties surrounding the installation. The analysis should result in the identification of existing development characteristics in the region and the major regional development trends.

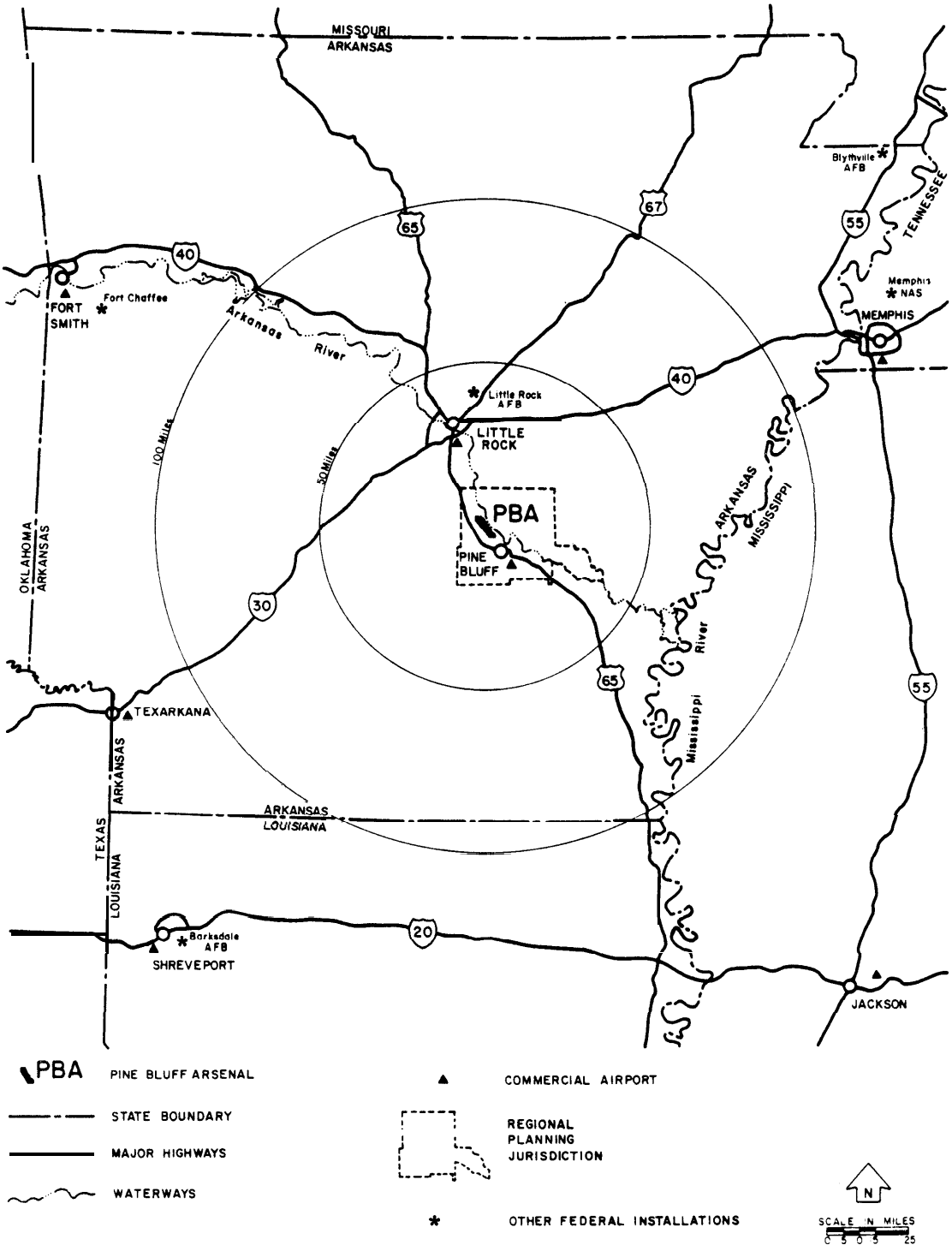

Figure 2–1. Regional setting.

. Vicinity. Typically, the vicinity is defined as that area within one to two miles of the installation boundaries. However, this definition is not exact. For example, certain factors such as airfield operations, weapons testing or storage or hazardous materials may require that the vicinity encompass a larger area. An exhibit showing the vicinity should be prepared and included in the Master Plan Report. Figure 2–2 gives an example of a Vicinity Map, which should include municipal boundaries, built-up areas, any large institutions, Federal installations, airfields, and major facilities providing access to the installation.

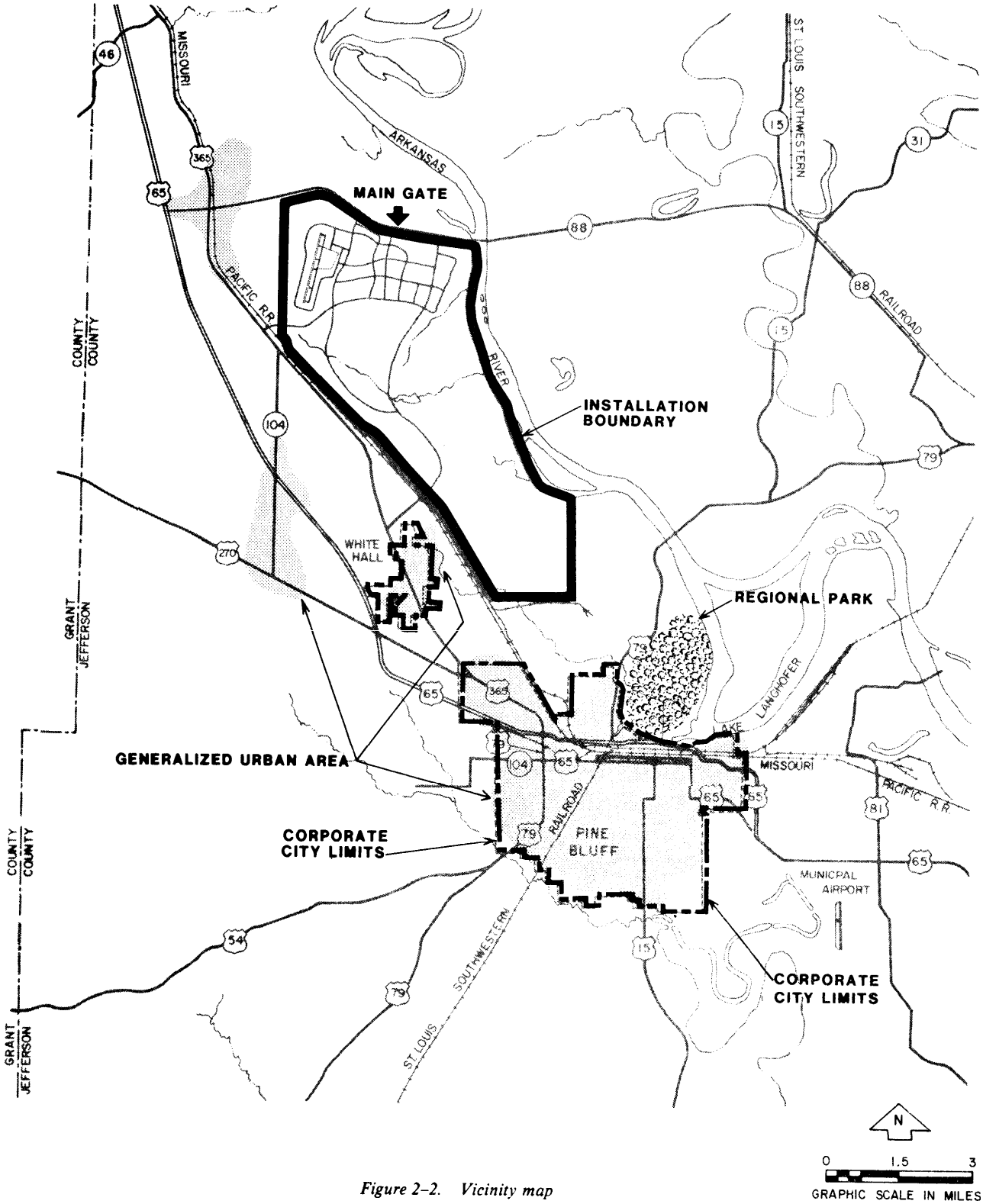

Figure 2–2. Vicinity map

2-$. Regional transportation system

Identifying the major characteristics of vehicular, rail, air. and water facilities which serve or support the installation provides a basis for evaluating limitations or deficiencies in the system which affect the operation and mission of the installation. The analysis should focus on elements of the system which link the installation to major population centers. other regional facilities. and the national transportation system. Major transportation elements should be illustrated in a graphic, perhaps as part of the Regional Setting exhibit or Vicinity Map as shown in figures 2-1 and 2-2.

a. Road network. The characteristics and capacity of the road network which provides access to the installation for both military and civilian traffic should be analyzed. The accessibility of the installation should be considered, particularly in relation to all segments of the National Defense Highway System in the region, including distance and route to the nearest interchange, clearance or capacity problems, and alternate routes. The location of marked Federal or State routes in the vicinity should be noted, along with major county roads and other roads providing direct access to the installation from major population centers and other Federal installations. Existing and projected traffic volumes on these roads should be determined to establish the capacity of the road network to serve the installation along with the adequacy of lane width and traffic control measures at installation access points. Finally, the effect of any programmed or planned improvements on the road network should be evaluated.

b. Rail service and terminals. The availability of facilities, service. and carriers should be determined. Elements to consider include: the location of the major rail line serving the installation. the carrier operating the line, and the number of tracks on the line; the number of daily or weekly scheduled trains on the major line: and any known load limits and condition of lines providing access to the installation.

c. Airports. The capability of regional airports to serve the installation should be assessed- Potential limitations on or conflicts with on-post operations can be identified by considering location. ownership, and type of airports within the region. indicating the largest aircraft handled by each: the flight path location and use in the installation vicinity; the location and frequency of scheduled airline service and availability of air freight or parcel service: and the regional airspace environment, including air traffic control locations. airways. terminal control areas. and airport traffic areas relating these two installation operations.

d. Water terminal. The availability of water terminal facilities to the installation should be evaluated. The evaluations should include consideration of the location of any barge or deep water terminal facilities in the region. the number of barges or ships accommodated, existing or projected usage levels, and known limitations of any cargo-handling facilities.

e. Public transportation. The availability of and level of service provided by public transportation from the installation to population centers should also be considered. Elements to identify include peak and off-hour transit routes. taxi service. and shuttle and limousine service

2-7. Socioeconomic conditions

Although off-post population and economic conditions can affect the installation's operation and personnel. a detailed socioeconomic analysis of the region is not required. Rather, a broad evaluation of key socioeconomic characteristics and trends provides an adequate basis for identifying potential areas of impact.

a. Population. Population trends and growth patterns which should be examined include.

- Existing and projected population and projected population growth rates within jurisdictions (counties. townships. municipalities) in the vicinity of the installation.
- Significant differences in growth rates among the jurisdictions or between a jurisdiction and the region as a whole.
- Significant deviation from national averages in median age. household size. percentage of elderly. or children of school age.
- Projected changes in population characteristics for the region or adjacent jurisdictions.

b. Economy. Factors establishing the relationship between the installation and the regional economy include:

- The existing and projected number of persons in the civilian labor force in the region and vicinity.
- Existing and projected employment levels in the region.
- Existing major skills or occupations and any projected changes in occupational distribution.
- Income within the region generated by the installation's total military and civilian payroll and its relationship on a per capita or proportional basis to other incomes in the region.
- Total dollar amount of regional procurement and construction by the installation within the past five years.
- Amount of taxes paid to local jurisdictions (either directly or through State or Federal aid formulas), including income tax. sales tax, motor fuel tax. or school aid.

c. Housing Analysis of off-post housing conditions and availability for installation personnel (military and dependents) requires coordination with the installation housing officer. Pertinent data include: character of housing in the region and vicinity. including dwelling type (single or multiple-family), occupancy (owner or rental). and age of residential structures: condition of housing units in the region and vicinity as evidenced by the percentage of substandard units and any known concentration of substandard units in the vicinity: vacancy rates for sale and rental housing and sale and rental price ranges of available off-post housing and availability of hotel and motel rooms in the vicinity.

2-8. Community land use and planning

Patterns of existing and projected land use in the vicinity of the installation may have a significant impact on future development of the installation. Therefore, existing and proposed land use patterns should be identified. Local land use controls in the vicinity of the installation determine whether development will be compatible with the installations activities. For agencies whose planning activities affect the installation, the status of adopted plans should be determined and the effect of these plans on the installation then should be evaluated

a. Existing and proposed land use.

(1) Identify any land use plans adopted by adjacent local jurisdictions. Determine their effect on local land use decisions and indicate the mechanism by which such plans are enforced

(2) Analyze existing and proposed land use for compatibility with installation development and operations.

(3) Include in the Master Plan Report exhibits which graphically portray existing and projected land use in the vicinity. The general land use categories to be used are agricultural, residential, commercial. industrial. public and institutional, and vacant. If a more detailed description is required for built-up areas or areas of unique character. additional categories may be used provided they are consistent with the basic categories. For example. specific public facilities, parks, or commercial areas may be designated by name. Existing and proposed land uses may be differentiated by direct notation. (such as “Regional Park” versus “Proposed Regional Park”) or by use of patterns which are documented in a legend. A typical pattern of community land use is shown in figure 2-3.

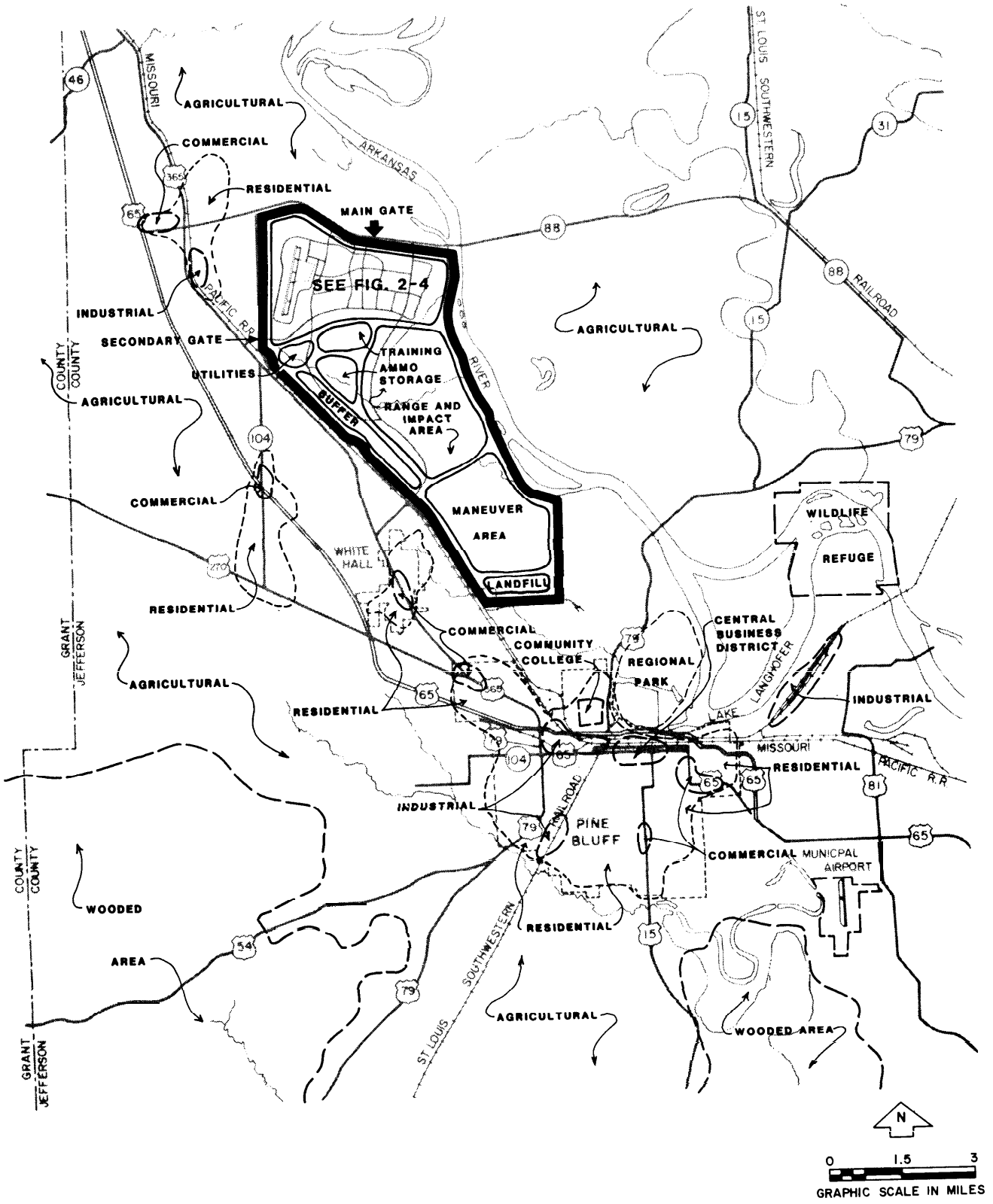

Figure 2–3. Community land use

(4) Compatibility of off-post land uses with installation operations is affected by the type and intensity of those uses. Evaluate these relationships to establish any impact on installation development. Evaulation criteria include:

Sensitivity of adjacent and uses (especially residential and institutional uses) to noise or installation operations.

- Intensity and character of adjacent land uses at points of access to the installation.

- The operation of adjacent land uses (especially commercial and industrial uses), considering effects of noise. vibration. smoke. or traffic generation from these land uses.

– Projected changes in type or intensity of land use in adjacent areas and the impact these changes would have on installation operations.

- Projected rate of development in adjacent areas, identifying the degree to which recent development has been consistent with proposed land use.

Obvious conflicts in projected land use patterns between the post and adjacent jurisdictions.

b. Land use controls.

(1) Local land use controls are the means by which community land use is regulated and implemented. In most cases, controls will be consistent with existing land uses. However, in some areas, zoning and land use will differ significantly. Also, private covenants or easements may play specific restrictions on adjacent land use.

(2) Land use controls and restrictions affecting development or redevelopment of land@ the installation vicinity should be identified In particular, the locations where existing zoning is significantly different from existing or proposed land use should be noted. as should locations adjacent to the installation where significant increases in density or intensity of development are permitted by local zoning. Also areas where existing zoning would permit a change in land use should be identified. particularly where development of vacant land would be permitted Likewise, the nature and duration of any known private restrictions or easements limiting the use of adjacent land should be noted

c. Historical and archaeological sites. All designated historical and archaeological sites located within the vicinity of the installation should be identified Each site will be listed according to agency title, numbering system, and current status. The impact on installation operations of regulations which protect such sites can then be evaluated.

2-9. Community services

a. Community services are usually available in the local area for use by installation personnel. Adequacy of these services can be determined by considering the area and number of people served accessibility in both time and distance to population served and capacity limitations of these facilities.

b. The evaluation of community services should consider.

- The location of general hospitals. outpatient clinics. or satellite facilities: emergency facilities: and other specialized facilities.

- Any agreements for the provision of primary or emergency police or fire protection to the installation by adjacent jurisdictions and the location of off-post facilities in relation to high-risk areas and access barriers.

– Agreements whereby installation services are available to adjacent jurisdictions.

- The location of elementary and high schools serving the installation and plans for additional school facilities or changes in school service areas.

- Location of community social and health services providing support for retired military personnel and their dependents.

- Higher educational facilities in the vicinity or region available for military personnel and dependents.

- Any agreements for utility services between the installation and adjacent jurisdictions or public utility companies, such as water supply, distribution. or storage: sanitary sewage collection and treatment; electric power, and natural gas transmission or storage. The type of agreement (primary service or emergency), along with any limitations on capacity or periods of service, should be specified.

- The location of public and private recreation sites in the vicinity and the range of recreation opportunities available.

2-10. Land leases and easements

The location and area of any off-post easements held by the installation or tracts of land leased for use by the installation should be identified. An evaluation of the terms of the lease or easement should include the purpose. duration. and conditions.

2-11. Federal support services

The relationship between the installation, its tenant units. satellites, and other Federal facilities may include agreements for provision of services, emergency assistance. or other support The installation also may be obligated to provide services to other Federal installations. or services may be provided to the installation by other Federal agencies.

a. The type of services provided by other Federal installations or agencies should be identified including the locations of these services and the number of installation personnel served The adequacy of the services can be evaluated based upon area and number of people served, accessibility in time and distance. and capacity of facilities.

b. Where on-post services are provided for other installations or agencies. the capacity of the installation to provide these services should be evaluated in light of installation mission requirements.

c. The impact of the Army Survival Measures Plan on the installation also should be evaluated and specific provisions of this plan which could affect long-range installation development should be identified.

Section III. ON-POST DATA ANALYSIS

2-12. Overview and sources

On-post data analysis consists of comprehensive evaluations of existing natural and man-made conditions on the installation. This analysis is concerned with all aspects of the installation. but particularly the limitations on the installation's *long*- range development must be clearly established. Information about on-post conditions is available from published reports. contributory plans, special studies. Existing Condition Maps. and on-post contacts and reconnaissance. The initial contact for on-post sources is the Director of Engineering and Housing (DEH) who will provide advice on data sources within other directorates or offices. Tenant unit missions, operations. and future requirements directly influence Master Plan development and should be included in data collection.

2-13. Natural Environment

On-post environmental conditions and the natural resource base will affect installation development. Such conditions should be evaluated particularly those natural elements which may create significant limitations for construction of buildings, roadways, utility systems, runways, training ranges. or other facilities. The evaluations should include geology, soils, topography, hydrology, and vegetation and wildlife.

a. Geologic conditions. The capability of underlying geological formations to support installation development should be identified. Limitations should be established, such as:

Low compression or bearing strength in areas of shale, limestone. and other sedimentary rocks requiring costly construction or engineering techniques.

Bedrock depths of less than 8 feet below the surface which could affect excavation for foundations and utilities.

Excessive bedrock depths which create unusual foundation requirements.

Areas of unconsolidated deposits such as sand. gravel. or other materials which are difficult to compact.

Fault lines. subsidence. or evidence of other geologic disturbance or hazards.

b. Soil conditions.

(1) Limitations of soil types and characteristics for excavation building foundations. and roadways or other pavement construction may be established based upon soil association or classifications. The limitations may include:

Unsuitability for compaction.

Low permeability causing poor drainage and pending

High water table causing prolonged wetness.

Inadequate stability due to lack of shear strength. potential frost heave, or high shrink-swell potential.

-- Susceptibility (o wind or water erosion.

-- Areas of muck. peat, or soils with high organic content.

- Unstable or denuded land

(2) The foundation material value of predominant soil types at the installation should be established.

(3) Where septic fields or lagoons are used to dispose of sewage effluent. the soil limitations for these locations should be evaluated. including seepage. high or low permeability and shallow depth to water table.

(4) Limitations caused by frost penetration of soil layers should be identified.

(5) Areas where severity of soil limitations may be increased by topographic and hydrologic factors should be Identified. These areas may include steep slopes or floodplains for example:

c. Topography.

(1) Elevation above sea level and the general topographic orientation of the installation should be identified. This analysis should concentrate on features restricting the use of portions of the installation. Potential features include:

-- Steep slopes with grades greater than 15 percent.

Moderate to steep slopes with grades between 10 and 15 percent where there is intense development.

– Minimal grades (typically one percent or less) with inadequate drainage and ponding of water.

Erosion on or any evidence of extensive soil slope failure along with related factors such as lack of vegetation or increased runoff contributing to these conditions.

Areas of irregular topography marked by rock outcropping or moraines creating construction diffculties.

The location and size of surface depressions.

(2) Topographic features which in turn affect climatic conditions should be identified. These effects vary substantially with geographic location but may include increases in wind velocities along crests and windward slopes in the direction of prevailing winds. potential fog and frost pockets in valley floors. or areas of coastal fog or increased humidity in coastal lowland areas.

(3) The impact of installation landforms on future development should be evaluated. Potential impacts are diverse and will reflect particular conditions of the installation site. Some factors to be considered include landform diversity where variations in topography create visual contrasts, such as a river valley between rolling hills: landforms as spatial determinants. such as steeply rising mountain slopes and promontories; or other highly visible landforms providing points of reference or visual landmarks, such as bedrock outcropping or domes.

d. Hydrology.

(1) Aquifer characteristics should be established. including the location of productive shallow depth aquifers subject to contamination through permeable soils, high water tables. or surface water flows: and aquifers which depend on recharge from seepage or surface waters.

(2) The impact of surface water drainage and storm water runoff should be analyzed. This analysis will identify:

- Acreage of drainage basins.
- Location of major stormwater channels.
- Direction of flow and quality of surface water.
- Effect of capacity limitations in drainageways such as siltation or inadequate culvert size.
- Percentage of built-up land area in each drainage basin.
- Excessive runnoff volumes due to topographic conditions or building coverage.
- Natural pending areas.

(3) Development limitations due to flooding along watenways or wetland areas should be established. The acreage and percentage of land subject to a one percent chance of flooding in a given year, the base flood area, areas of tidal inundations, and wetland areas (swamp, marsh. or bog) should be itemized. Problems of water quality or effect of seasonal variation in wetland areas should also be identified and the impact of wetland protection measures or flood control regulations on installation development should be evaluated.

e. Vegetation and wildlife. Critical habitats, endangered species. or resource management programs on the installation should be analyzed. However, a detailed listing of habitats and species is not required. Rather, the analysis should summarize potential constraints to development The following elements should be considered in this analysis:

- The predominant type of vegetation on undeveloped portions of the installation and the location of areas of significance.
- Habitats of any known protected or endangered species and the effect of prescribed protective measures.
- Impact of fish and wildlife management programs.
- Use of on-post areas for hunting and fishing.
- Installation land management programs for barren areas. emergent vegetation range vegetation and wetlands vegetation.
- Forestry management requirements such as fire lanes and buffer zones.

2-14. Human environment

Each installation also reflects the human influence. For example, the historic and archaeological setting provides information about the area's past and may affect the installation's future. The characteristics of current military. dependent, and other support populations and of population forecasts and trends are part of the human environment Military community services offered by the installation and specialized activities such as outdoor ranges and maneuver areas also contribute to the human environment. Each of these characteristics should be investigated for their potential influence on plan developmcnt.

a. Historic and archaeological setting. The history of the area may be obtained from on-post records or from off-post sources such as local planning agencies or the local library. This history should be reviewed for its potential to influence the future of the installation. Standards and procedures for the preservation of historic features and archaeological sites, as set forward in TM5-80 -1 and TM 5–801 -2 should also be, reviewed Federal. State. county. and installation historic and archaeological sites of record should be identified and recorded on a work map with the appropriate agency identification numbers. The effect of presentation standards on future development should be determined and documented

b. Current and forecasted demographics. The installation population includes all military personnel and their dependents. supported retirees. civilian employees and contractors. and other persons using on-post facilities.

(1) Military personnel. Active military should be identified according to the percentage of personnel in groups as reported in DD Form 1657. which is developed in accordance with AR 210-11. The effect of increases or decreases in the number of personnel required to obtain the installation's planning strength should be evaluated.

(2) Dependents. The total number and composition of dependents are principal determinants of installation requirements for a wide range of services and facilities. including education. health. and recreation. The total number and composition of households should be identified following guidance provided by DOD Instruction 4165 .45. the proponent for DD Form 1378. "Determination of Family Housing Requirements." The effect of projected increases and decreases in the number of dependents when the installation reaches its planning strength should be evaluated.

(3) Other supported population. The present number of other population supported by the installation should be identified along with the effect of any projected increases or decreases. Other supported population includes:

- Civilian employees (both appropriated and non-appropriated fund).
- Military personnel employed on-post but not stationed on-post
- Army Reserve and National Guard personnel using the installation.
- Transient personnel and hospital patients (daily average).
- Retired personnel and their dependents.
- Civilian groups using installation facilities over short stays (such as Boy Scouts).

c. Military community services. Evaluation factors for community services include number of people (military. dependents. and civilians) served accessibility in both time and distance to the population served. and the size of the facility. The effect of private business providing equivalent services in the vicinity and the availability of public off-post facilities to supplement on-post facilities also should be considered.

(1) Medical and dental services. These services may include emergency services; out-patient services (including clinics): acute care services (including general hospitals): and specialized services. Each service should be evaluated separately in terms of its function and relationship to other medical or dental services. Factors to consider include accessibility to work and housing areas. directness of access for off-post patients. and impact of traffic noise or other nuisances. The availability of ambulance service should be identified.

(2) Fire protection. On-post fire protection facilities should be evaluated for response time and coverage of built-up areas. This evaluation is based on proximity to high-risk areas; the impact of natural or man-made barriers (e.g., waterways or rail lines); traffic congestion; and capacity of the facilities to house the necessary equipment.

(3) Security. The adequacy of on-post facilities to protect and control access to the installation should be evaluated. Where restricted access facilities are located within or near built-up areas of the installation, their effect on adjacent land uses should be evaluated and any limitations on future development in areas requiring restricted access should be identified.

(4) Recreation. The ability of recreation facilities to efficiently serve the current and projected installation population should be ascertained Coordination with the Morale Support Officer and use of the Installation Recreation Master Plan or special studies will provide appropriate data. Deficiencies in specific facilities should be identified based upon Department of the Army or Department of Defense criteria. The impact of facility use by the general public or off-post personnel should be considered. In some instances, recreation needs may be served by facilities with a primarily non-recreational function. Examples include outdoor play environments in family housing and school playground areas. These facilities should be included in the assessment of recreation needs. Recreation limitations which may be caused by proximity to sensitive or hazardous land uses also should be determined. Specialized uses of recreation areas on a seasonal or limited basis (for example, fishing or hunting within open maneuver areas, and recreational use of small arms ranges) should be noted. The evaluation should identify the scope of these activities. The area used, the number of participants, and available to the general public.

(5) Education. Service capacity of on-post educational facilities should be established, including nursery, pre-school, child care centers: elementary and secondary schools; and those providing adult education and college courses. The accessibility of educational facilities to the population served should be evaluated and any limitations due to installation operations should be identified.

d. Outdoor ranges. Range analysis is necessary to ensure that safety requirements are met in installation planning. Range information will be coordinated with the Installation Training Officer. Training Circulars (TCs) are a guide for determining the adequacy of existing ranges. The TCs indicate what ranges are required the capacity, and the iteration requirements for each range. The range analysis establishes what facilities are needed based upon identified training mission. frequency of use. weapon systems, and units involved.

(1) Required information for the outdoor range analysis includes:

- Environment limitations and terrain profiles for land available on-post and at other accessible training areas. This includes both the Reserve Component (RC) and the Week-End Training Sites (WETS).

Current training strategies standardized for army-wide use and U.S. Army Training and Doctrine Command (TRADOC) and service schools.

Expected arrival date and training requirements for new weapon systems.

Range safety requirements and waivers.

(2) Each range should be listed by installation name and number. Table 2-2 gives and example of a typical outdoor range inventory.

Table 2-2. Example of outdoor firing range inventory.

	Range	Existing Quantity	Existing Number of Firing Points	Condition Code	Remarks
1.	Basic 25M Zero Rifle	1	100	B	32 PTS Unusable/No Night Fire
2.	Field Firing	1	35	B	Faulty Wiring Limits Use
3.	Record Firing	1	16	B	Faulty Wiring Limits Use
4.	Target Detection	4	16	A	Minor Repairs Needed
5.	Rifle, Known Distance	1	75	B	Minor Repairs Needed
6.	M/G, Transition			C	On Range #10
7.	M/G, 10M			D	
8.	M/G, Field Firing			C	On Range #9
9.	M/G, Daylight Assault	1	30	A	Under Construction
10.	M/G, Predetermined	1	40	A	Under Construction
11.	Pistol 45 & 38			D	Not Full Size for Qualification
12.	Aerial Gunnery Tables I, II, IV, V	7	NA	A	Not Full Size for Qualification
13.	Aerial Gunnery Crew			D	Not Full Size for Qualification
14.	Aerial Gunnery Team			D	Not Full Size for Qualification
15.	Cannon, Ground Role (Vulcan)	1	NA	A	Not Full Size for Qua ification
16.	Cannon, Air Defense (Vulcan)	1	NA	A	Not Full Size for Qua ification
17.	TOW Missile Stationary			C	On TTIV/Lacks Range
18.	TOW Missile Moving Target			B	On TTIV/Lacks Range
19.	Dragon Missile Stationary			C	1 Day on Tank Table IV
20.	Dragon Missile Moving			C	1 Day on Tank Table IV
21.	Mortar Field Firing			C	On Artillery Ranges
22.	Tank Table I	1	10	B	Permits Use by Only 2 Tanks

Code Meaning:
A = Existing range in satisfactory condition.
B = Existing range with deficiencies.
C = Superimposed on another range.
D = Required range not existing.

(3) The outdoor range inventory can be compared with the TCs and installation requirements to determine range deficiencies. Then these deficiencies may be listed and analyzed. In consultation with the Training Officer, the total number of people the installation can proficiently train should be established. To insure ranges are effective and economical, the following elements should be considered:

- Conformance with terrain profiles for specific weapons systems.
- Conformance with the Army Training and Evaluation Program (ARTEP) training requirements and standard layouts in TCs and Army Regulations (ARs).
- Ability to be threat-oriented with realistic portrayal of targets.
- Layout flexibility to incorporate changes in training requirements and scenarios.
- Efficient locations to save fuel.

Overlapping ranges and Surface Danger Zones to save space.

- Subcaliber ranges. engagements exercises. and simulations to save ammunition.
- Recycling old or obsolete ranges [o meet training needs.
- Need for unique training facilities.

e. Maneuver areas.

(1) To accomodate necessary tactical maneuvers at the installation. efficient use of maneuver areas is necessary. The Training Offilcer is the source of information for how maneuver training is performed at the installation. Available acreage should be listed as shown in table 2-3. Overlapping acreage should be identified as should the largest contiguous maneuver acreage. A metric conversion for all maneuver area acreages should be provided so that comparisons can be made with TCs.

Table 2-3. Example of maneuver area inventory

Training Area	Number of Acres		Remarks
	Armor	Infantry	
1		1,250	Isolated along southeast boundary of the installation.
2		4,124	
3	3,863		
4	2,287		Training is limited by three cemeteries and areas designated "off-limit".
5		1,519	
6	1,447		
7		2,807	
8	3,849		10,854 contiguous acres surrounding Grahamtom Recreation Area.
9	2,370		
10	4,635		
11	6,269		Used principally by the U.S. Army Reserve.
12	941		Magazine compound precludes the use of this area for tactical training.
13	3,752		
TOTAL	29,413 Ac.	9,700 Ac.	

(2) Acreage requirements for supporting the largest maneuver training event should be established by comparing the largest contiguous acreage with the total required acreage. The suitability of the area's configuration for the event also should be determined.

(3) The current use of permanently installed training facilities. airfields. roads. railroads. and service facilities should be identified.

(4) The ability of existing areas to accommodate additional maneuver training should be evaluated and potential new areas for maneuvers should be identified. All available terrain should be considered for maneuver areas except environmentally sensitive areas, historic sites, cantonment areas, and munition impact areas. Appropriate areas include streams, rivers, or lakes suitable for construction of fixed and floating bridges and river crossing expedients; areas permitting construction of obstacles; or areas permitting live fire maneuvers outside the normal impact area (such as in a temporary impact area).

2-15. Safety and health

Numerous elements contribute to safety and health on the installation. Each of the following activities or characteristics should be identified and evaluated in terms of their current and future interface with the installation mission and operation.

a. Air operations. The limitations for both fixed wing and rotary wing aircraft should be considered. TM 5-803-7 should be consulted for this analysis. which will establish the average number of monthly flights. largest type of aircraft accommodated, type of airfield, and condition of runaways and taxiways. Temporary and permanent waivers should be identified and land use conflicts not covered by waivers within Runway Clear Zones, Safety Takeoff Zones, and Accident Potential Zones should be evaluated. The effect on long-range development of approach and departure clearances and height obstructions will be clearly established.

b. Explosives storage and handling. Ammunition and explosive handling operations include holding areas. work

areas. and storage areas as well as shipping of explosives by air. truck. or train. Development limitations should be established based on quantity safety distance requirements (TM 9-1300–206 and AR 385 -64). Existing temporary and permanent waivers should be identified. Evaluation of the impact of demolition operations can be based upon installation standard operating procedures (SOPS). type and quantity of munitions involved. by-products. and by-products disposal procedures.

c. Outdoor ranges. Safety limitations will be established in accordance with applicable regulations including the installation SOP. Surface Danger Zones will be identified for all outdoor ranges and firing points and the effect of range denials and waivers will be evaluated.

d. Hazardous material. Safety imitations for storage of hazardous solid waste materials, toxic substances. and flammable and combustible liquids are established by hazardous material safety clearances and installation SOP. AR200-i. and AR 385-10. On-post routes for the transport of hazardous substances should be identified. For any hazardous or contaminated sites. the size of the area. type of contaminant, estimated quantity of contaminant, and the present status of use restrictions will be determined

e. Electromagnetic safety. Safety clearances and installation SOP for operations producing electromagnetic emissions such as microwave, infrared. ultraviolet, and X-ray waves should be identified. Consideration should be given to the effect of shielding facilities producing electromagnetic emissions. The impact on air operations also should be established.

f. Radiation safety. Safety imitations for radiation exposure including ionizing sources. non- ionizing sources, and laser are established by safety clearances and installation SOP. AR 200-1, and AR 385-10. Shielding and other protective measures will have a recognizable effect. Permanent and temporary waivers should be identified. as should transportation routes for radioactive materials and the effect of off-post imitations on transportation of these materials.

g, Air quality. On-post air quality should be evaluated in conjunction with applicable standards. The Federal. State. or local environmental monitoring agency can provide air quality data for local monitoring stations. The effect of significant point source emissions and the type and pattern of these emissions should be evaluatcd. On-post contribution to local and regiona air quality should be considered specifically particulates. carbon monoxide. and hydrocarbons.

h. Noise abatement. Activities generating significant noise levels on-post should be identified in accordance with Federal, State, or local noise monitoring agencies and standards. Limitations should be established from:

- Stationary activities which either generate significant noise or are in violation of existing noise standards.
- ICUZ Zone 111 impacts for both fixed wing and rotary wing aircraft.
- Noise-generating activities in open testing training and maneuver areas.
- Blast noise from tiring operations.

Temporary and permanent waivers should be identified and the effect of shielding or other noise-supprcssive measures should be considered.

i. Water quality. State and local regulations and monitoring programs for both potable and non-potable water should be consulted. Also, locations of on-post water monitoring stations and the nearest off-post stations on streams receiving discharge or runoff from the installation should be identified. Installation impact on adjacent community surface or groundwater supply should be evaluated, with particular attention to aquifers and their recharge areas.

2-16. Land use/circulation/utilities relationships

a. Land use. The analysis of on-post land use consists of an overview of existing land use patterns to identify major spatial relationships and land availability. This information is further analyzed in light of the installation' s mission and facility requirements.

(1) The existing land use pattern should be established by categorizing on-post land use areas according to the principal activities. Categories used in classifying land use areas are listed in table 2-4. Land use areas should be generalized rather than site specific and should include all areas occupied by buildings and support facilities.

Table 2–4. Land use categories.

ADMINISTRATION
Activities which have a primary responsibility of providing administrative services for the installation as a whole.

TRAINING
Activities which provide military training for personnel, including maneuver areas, outdoor firing ranges, and firing points.

OPERATIONS
Activities which support the installation's primary mission such as an airfield, heliport, communication (including antenna fields), etc.

SUPPLY/STORAGE
Activities involving the provision or storage of materials and equipment, including food, clothing, ammunition, and fuel.

MAINTENANCE
Activities involving the repair and servicing of operational equipment, vehicles, buildings and grounds, and other uses associated with such activities.

RESERVED LAND/BUFFER
Areas which are restricted for permanent habitable structures because of natural physical constraints, operational restrictions, or aesthetic requirements.

MANUFACTURING AND PRODUCTION
Activities involving the fabrication or assembly of products which are destined for other commands or installations.

RESEARCH, DEVELOPMENT, AND TESTING
Areas in which the conduct of research or testing of material and processes is the primary use, and where these activities are general in scope rather than limited to the direct support of another activity at the installation.

TROOP HOUSING
All non-family housing facilities including those for enlisted personnel, non-commissioned officers, and commissioned officers, along with service, administrative, supply, and other incidental facilities related to troop housing.

FAMILY HOUSING
All facilities which house military personnel and their dependents, along with any incidental facilities which would serve only a specific housing area.

COMMERCIAL SERVICES
Services provided on a commercial basis such as the commissary, post exchange, banks, gas station, etc.

COMMUNITY FACILITIES
Activities which provide personnel services such as the chapel, library, day care center, schools, and the post museum.

MEDICAL AND DENTAL
Areas used primarily for diagnosis and treatment of patients.

RECREATION
Facilities, either open or with structures, which are used for organized or unorganized recreational activities or provide open areas for parades and reviews.

UTILITIES
Areas, either open or with structures, which are used to provide utilities including water or sewage treatment facilities, heating and power generating plants, and major distribution and storage facilities.

WATER AREAS
All surface waters and pond areas which have a year-round water level.

(2) An exhibit will be included in the Master Plan Report to show the location of land use areas at the installation in relation to the limits of the cantonment or built-up area and to the overall installation site. A typical land use exhibit for the cantonment area of an installation is shown in figure 2-4.

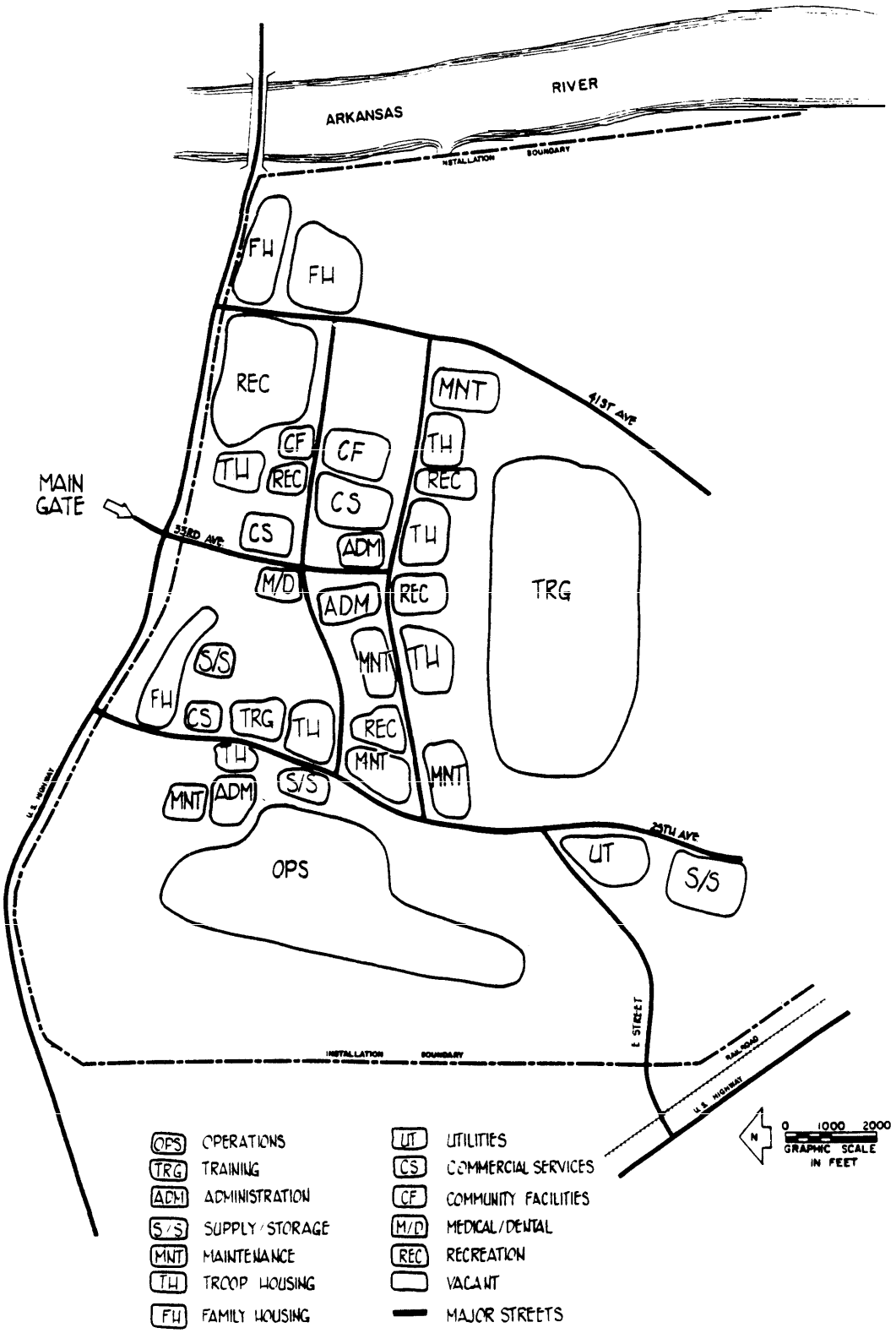

Figure 2-4. Existing land use pattern.

(3) Identify significant functional problems, incompatibilities, or operational conflicts created by existing land use relationships. Where existing relationships are sound evaluate the potential for fitting future development into the present land use pattern.

(a) Criteria such as proximity, compatibility, and efficiency of services are used to evaluate land use relationships. Land use areas with activities which are functionally related should be located within easy access to each other, with related activities located closest together. Land use areas which have comparable levels of activity as measured by intensity, duration, and frequency of use, or where the scale or density of buildings is similar, are generally compatible. Land uses are likely to be incompatible when the intensity, duration, and frequency of use, or where the scale or density of buildings is similar, are generally compatible. Land uses are likely to be incompatible when the intensity and frequency of adjacent uses differ greatly, and when impacts such as noise or traffic volume are felt beyond the immediate area of activity. For example, a motor pool located next to a family housing area would be considered an incompatible land use relationship. Uses which have similar service requirements should be located so that the necessary services can be provided most efficiently. Widely scattered uses are more difficult to seine. Those uses dependent on a specific service should be located close to facilities which provide that service, while uses which depend to a lesser degree on a particular service can be located at a greater distance from it.

(b) Application of these criteria will vary from installation to installation depending on the specific mission and fictional needs of a particular post. Therefore, understanding the installation's mission is necessary to properly evaluate land use relationships. Also, the present land use pattern and relationship may have been influenced by previous missions; therefore, knowledge of the history and development of the installation will be helpful in evaluating present conditions.

(c) In addition to basic locational criteria the existing arrangement and grouping of building sites within developed areas may affect land use. While the land use analysis should not include a detailed survey of building sites, factors which may affect the functional capacity of land use areas include: availability of adjacent land area for potential expansion; ability to accommodate existing levels of activity on a site without overcrowding compatibility of existing functions on a site; and the permanence of existing buildings on a site.

(d) Natural site features may also affect the existing land use pattern and relationships. The land use pattern should be compared with the limitations identified in the analysis of natural features to determine the ways in which natural features contribute to existing land use problems. This comparison will also provide the basis for evaluating the extent to which any natural site conditions create constraints for existing land uses or for expansion.

b. Traffic circulation.

(1) Road network. The existing roadway network should be functionally related to the land use and activity pattern which it serves. An evacuation of the existing network will identify problems in providing access to or circulation between land use areas, as well as any potential constraints imposed on new development due to the location of existing roadways.

(a) Roadways are classified as primary, secondary, and tertiary, in accordance with TM 5-822-2. This classification reflects existing traffic volumes, roadway characteristics, and on-post travel patterns. A typical installation roadway network is shown in figure 2-5. The effectiveness of the overall network should be evaluated and particular access or circulation problems should be identified

Evaluation factors include:

- Directness of primary or secondary roadway access to high intensity land uses or major traffic generators.
- Directness of access routes for off-post traffic.
- Lack of road access to undeveloped areas.
- Continuity of alignment on primary roads and traffic routes.
- Impact of traffic patterns on housing and community service areas.
– Conflict of major traffic routes with pedestrian movement.

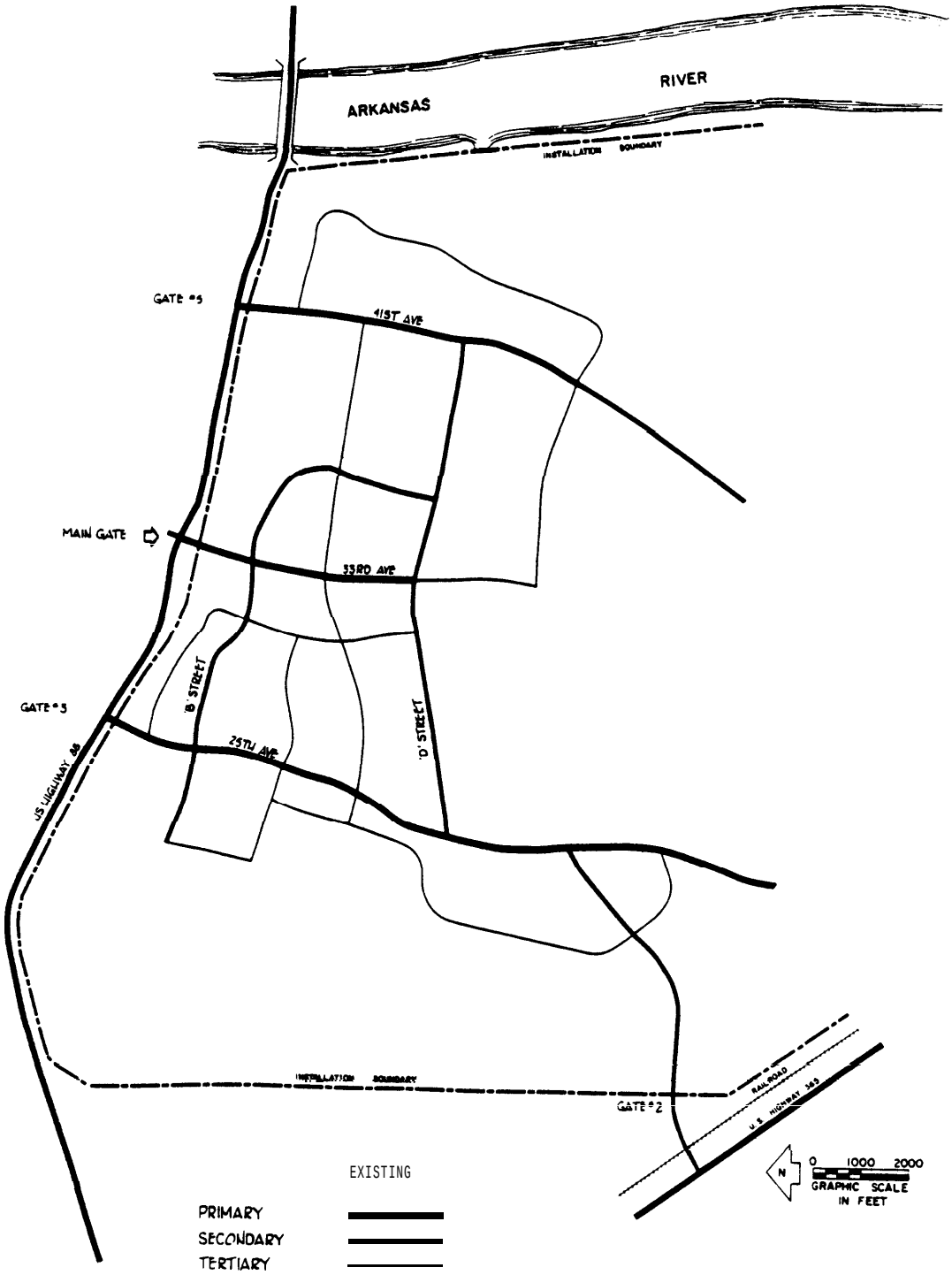

Figure 2-5. Existing road network.

(b) Existing traffic data should be reviewed to identify specific deficiencies which could limit future development These deficiencies may include:

- At-grade vehicular/rail crossings.
- Inadequate load limits or poor structural condition of bridges.
- Traffic congestion.
- On-street parking.

(c) The effect of any planned or programmed roadway improvements on land uses should be evaluated Such effects include changes in traffic volumes, changes in access points to major traffic generators, or changes in routes used by service and truck traffic.

(2) Air, rail, and water transportation facilities. On-post air, rail, and water transportation facilities should be evaluated to determine their ability to support installation operational requirements. Evaluation factors include the structural condition of facilities, the capacity limits of cargo or personnel handling facilities, and the number and type of rail cars, aircraft, or waterborne craft which can be accommodated

c. Utility system. Installation growth is dependent upon the adequacy of the utility systems to meet increased demand and peacetime environmental constraints while maintaining recommended reserve allowances for demand surges. Like the transportation system, the installation's utility systems bear a direct relationship with land use. The utilities analysis should focus upon the major components of each system. Installation utility system maps, special studies, system operational and testing records. and system analyses may be used to tabulate historic consumption rates and develop projected consumption rates based on the effective population. These rates establish system carrying capacities to support the installation planning strength. The analysis should be coordinated with off-post data analyses to identify the impact of off-post supply or service limitations on installation systems. Schematic diagrams should be prepared for each trunk line utility systems. These diagrams will be used to analyze the relationship between various land use areas and utilities.

(1) Effective population.

(a) Carrying capacity for each utility system is determined by the effective population of the installation. Effective population is based upon a ratio of the total population using installation utility systems on a given day. It is computed as shown in table 2-5. The effective population served differs for the various utility systems within an installation. For example, a portion of a family housing area may discharge its domestic waste directly to an adjacent municipal sanitary sewer rather than to the on-post system facility, even though that area may obtain all other utility services from the installation.

Table 2–5. Example of effective population computation.

	Total Number of Persons	Factor	Effective On-Post Population
Military Living On-Post	14,978 *	100%	14,978
Dependents Living On-Post	4,955	100%	4,955
Military Living Off-Post	1,500 *	33%	500
Transients/TDY Personnel	420	100%	420
Civilian Employees	5,136	33%	1,712
Contractor Personnel (construction workers, etc.)	210	33%	70
TOTALS	27,199		22,635

* Sum of these two numbers represents current assigned military strength.

(b) Population peaks are very important in determining maximum demand. This includes time overlaps of personnel arriving and leaving an installation. When the population peaks are seasonal or associated with weekend training a monthly effective population may be computed. It may be necessary to weight or prorate the figures to obtain a representative monthly population. After it is determined, the effective population is applied to utility usage rates to generate capacity requirements.

(c) A determination should be made of the magnitude of improvement necessary to remove the first level of limitation within the system to raise its overall carrying capacity. The general cost level and the time required to correct the limitation should be established

(d) Special requirements for fire protection and commercial/industrial-type uses within the installation also should be identified Potable and non-potable systems should be examined separately when both exist at an installation.

(3) Sewerage system.

(a) The degree of sewerage system coverage should be related to present land use and topography. Those areas which use septic tanks with tile fields or packaged treatment units will be identified as will on-post areas not connected to the installation collection system or off-post areas connected to the on-post system. A review of the effective population figures will reveal areas of service limitations due to high density housing or industrial flow served by small diameter lines.

(b) The carrying capacity of each major component of the sewerage system—trunk lines, major lift or pumping stations, and on-post treatment facilities- will be established using the appropriate per capita domestic contribution rate. Where treatment is provided off-post, contract limitations on treatment should be verified Significant limitations in the collection system such as inflow and infiltration problems should be identified and the necessary corrective measures should be documented Significant on-post sources of industrial waste waters and type of waste generated also should be identified The National Pollutant Discharge Elimination System (NPDES) Permit Program regulates discharge into surface streams. The need for NPDES permit should be evaluated. The effectiveness of SOP and treatment to handle the waste load should be analyzed

(c) The magnitude of improvement necessary to remove the first level of limitation will be established, including the general cost level and the time required to correct the limitation.

(4) Solid waste.

(a) Waste disposal methods used, disposal locations, and the percentage of total waste disposed in each location should be identified for the installation. Significant waste generators should be noted along with the type of waste generated and its treatment and disposal. The features of any local recycling operations should be documented

(b) The carrying capacity of major waste disposal facilities should be determined, including landfill sites. transfer stations, incinerators, or resource recovery plants. Collection procedures should be reviewed. Waste collection and disposal records for the past two or three years will establish per capita and industrial contribution rates. When no reliable data are available, the analysis should be based on a domestic contribution rate of 8 pounds capacity per day, translated to 800 pounds per cubic yard compacted

(c) Means of removing system limitations and determining the maximum accelerated use of present landfill capacity will be identified Since landfill capacity is a direct function of generation rate and time, remaining available landfill volume can be used to support a constant effective population for a specific number of years Expansion requirements are based on the installation planning strength.

(5) Storm drainage.

(a) Local drainage patterns, steep slopes, floodplains, and wetlands relate to storm drainage characteristics. Areas of historic flooding or pending should be identified.

(b) Design flows of major storm drainage components should be established to determine the capacity needed to safely confine and convey design flows appropriate to the installation mission. Limitations in the existing system and their influence on installation mission and objectives should be identified so that the potential for reduction in flooding through system improvements can be defined.

(6) Electric power system.

(a) Electricity may be self-generated or supplied to the installation, Off-post supplier(s) will provide information about system limitations due to equipment capacity or contract agreements. An evacuation of the location of on-post generating facilities will identify possible land use conflicts.

(b) The present distribution system should be examined relative to present land uses in terms of degree of coverage, loading of substations, routing of circuits, and availability of alternate supplies. Available data may be used to identify existing service and distribution problems.

(c) The carrying capacity for major components-supply, transmission transformers, and distribution circuits-should be established. In particular, the impact of industrial energy demand on the system should be noted. Street and security lighting are also part of the electric power system. These items should be examined sufficiently to determine the type, location, and adequacy of existing systems. Limitation factors of the system should be identified and the magnitude and cost of eliminating the first level of limitations should be established

(7) Fuels, heating and cooling.

(a) Department of the-Army policy provides the basis for analyzing energy sources, fuel services, and storage capacities relative to fuel procurement policies. Off-post suppliers will provide data to establish available supply, connection points, and distribution mains within and in the vicinity of the installation. Contract limitations and fuel source priorities should be identified, as should available forecasts that directly limit the supply of fuel to the installation.

(b) The service area of on-post distribution systems should be identified for natural gas, heating steam or hot water, and cooling chilled water. The location of central heating and cooling plants, fuel oil storage tanks, and coal storage and handling yards should be evaluated in terms of their relationship to other land uses. Areas of actual or suspected low pressure and locations of high demand for production needs should be identified

(c) The carrying capacity of major components should be analyzed baaed on the current Basewide Energy Systems Plan. The relationship of demand during peak and non-peak periods to the capacity of central plants should be assessed The age and condition of equipment should be noted, as should limitations relating to fuel, steam and high temperature water, and cooling distribution lines. Fuel storage capacity can be analyzed based on historical peaks, heating fuel supply conditions, and major component limitations. Methods for eliminating system limitations should be identified

(d) The magnitude and cost of on-post system improvements to remove the initial limitations within each system should be estimated Department of Defense fuel supply agency and transmission supplier policies provide guidance for establishing future energy use and reserve requirements.

(8) Communications and telephone system. An examination of on-post communications facilities will be coordinated with the Installation Communications-E1ectronics Officer and the serving telephone company. The existing level of service and the capacity of major telephone facilities and trunkline routings will be established to identify service limitations. The response time required for upgrading or increasing the telephone service capacity should be reviewed Response time requirements are dependent upon the communication facilities rather than on population

Section IV. SUMMARY OF LIMITATIONS

2-17. Description

Based upon the comprehensive analysis of on-post and off-post conditions, a summary of limitations should be prepared This summary identifies those specific conditions which most directly affect the installation's ability to carry out its mission. This summary should not simply repeat the findings of the data collection and analysis although references to previous sections of the analyses should be used to support the conclusions reached The summary should clearly convey why particular conditions are important in relation to the overall character of existing and future development of the installation.

2-18. Buildable areas

The off-post and on-post analyses together identify those conditions which combine to delimit buildable areas for the installation An exhibit of available buildable areas, like the one shown in figure 2-6, will be included in the Master Plan Report The buildable areas of an installation exclude all portions of the installation having one or more site development limitations. Such limitations may be related to natural features, safety distance requirements, air operations, training and maneuver requirements, or other significant restrictions.

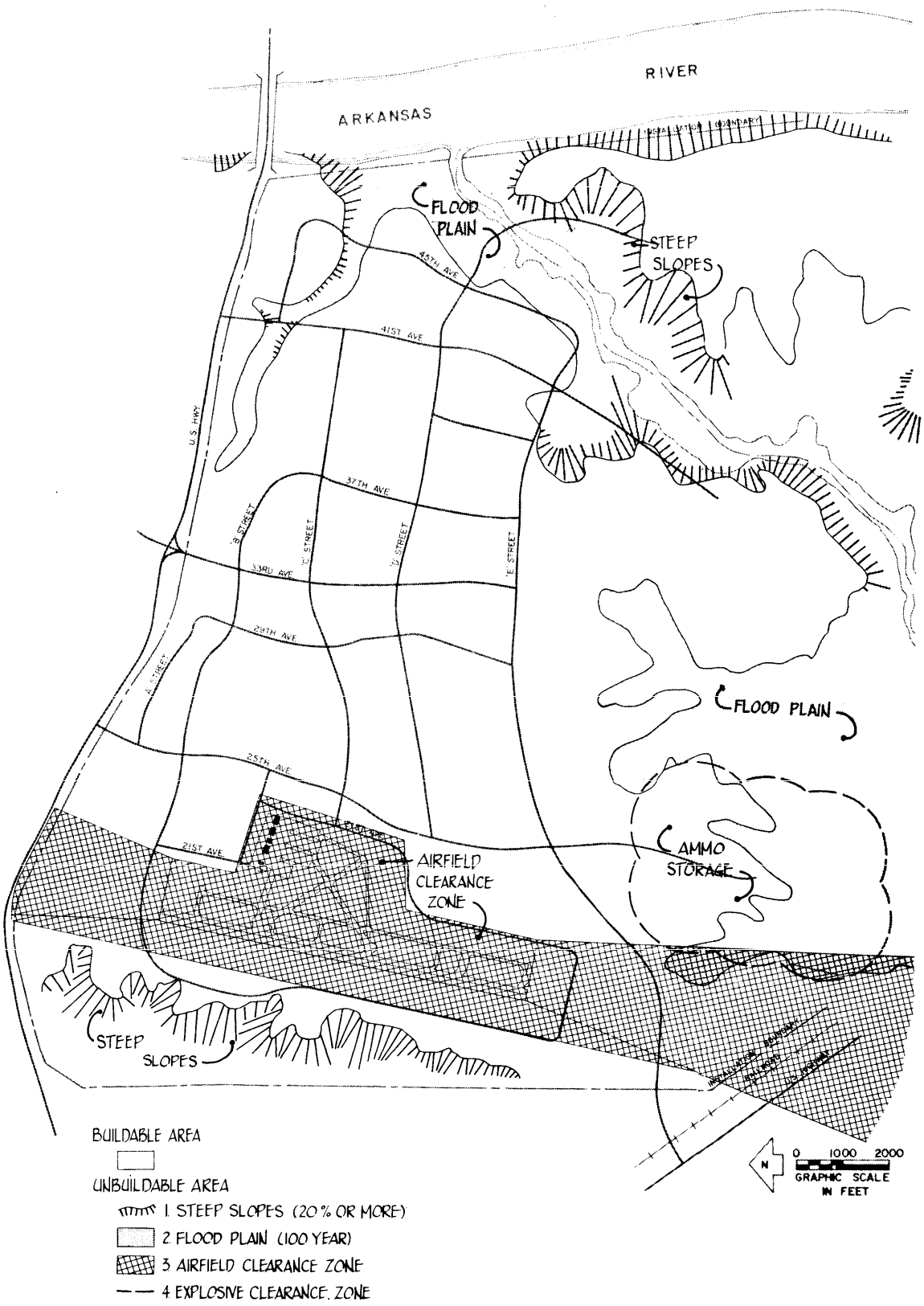

Figure 2–6. Buildable areas.

2-19. Mission definition.

An understanding of the installation's mission is mandatory in planning for future development Installation organization regulations (10-series) identify the assigned mission and describe the elements of the mission carried out by the installation commander, officers, and units. The mission statement should be reviewed to identify the principal mission objectives. The types of activities-such as support, training, administration, production-which are necessary to carry out the mission should be noted, with a working list of mission objectives and principal operations and activities. An example is shown in figure 2-7.

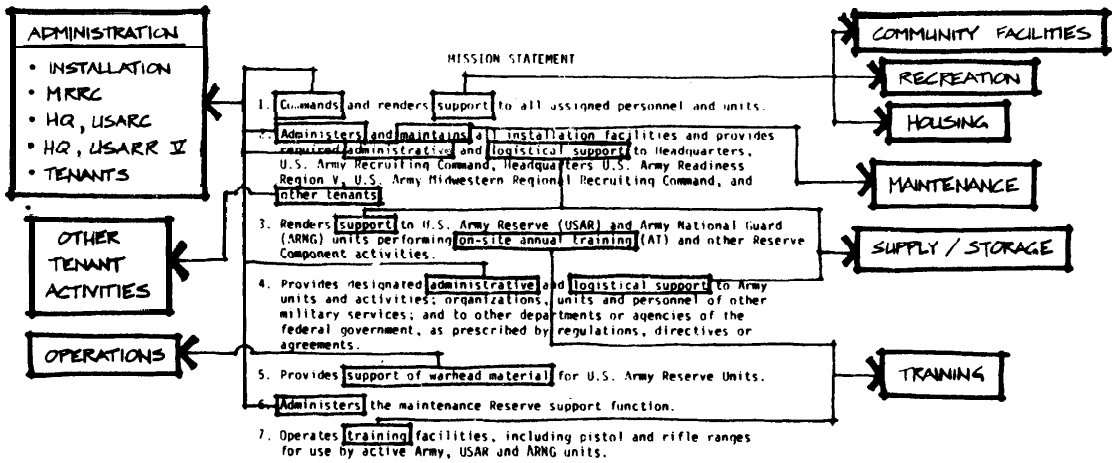

Figure 2–7. Example of installation mission objectives and activities.

2-20. Organizational structure.

a. Each installation has an organizational structure reflecting its mission. Figure 2-8 gives an example. While this organizational structure defines command relationships, it also can be used to identify other relationships between units stationed at the installation. A comparison of the organizational structure with the listing of mission objective and activities will establish which units carry out similar activities and will identify those units which provide support to their units.

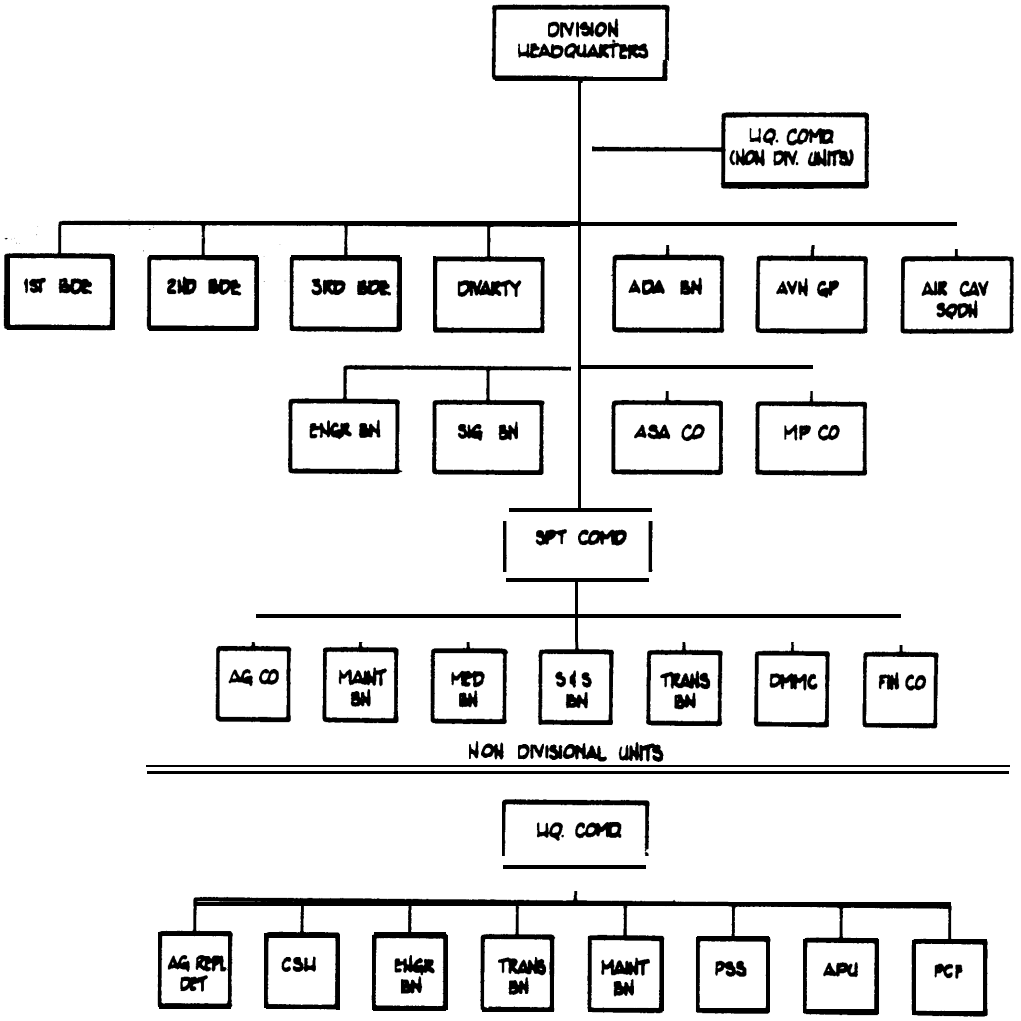

Figure 2–8. Example of organizational structure.

b. Mission objectives and the activities of major tenant units have an effect on interrelationships among units. Tenant activities with support functions or requirements should be identified

2-21 . Planning strength.

a The installation planning strength is determined by the aggregate strength of units assigned to carry out the mission. The planning strength for the installation is identified in the Army Stationing and Installation Plan (ASIP). The current ASIP planning strength should be compared with the most recent actual unit strengths. Analysis of the Table of Organization and Equipment (TOE) and the Table of Distribution and Allowance (TDA) personnel allowances will establish planned increases or decreases in existing units, including tenant units. These changes will form the basis for identifying changes in installation population.

b. The aggregate strength of assigned units determines the facilities required to support the installation mission. The TERF identifies the scope of all required facilities, based upon authorized basic facilities and space allowances.

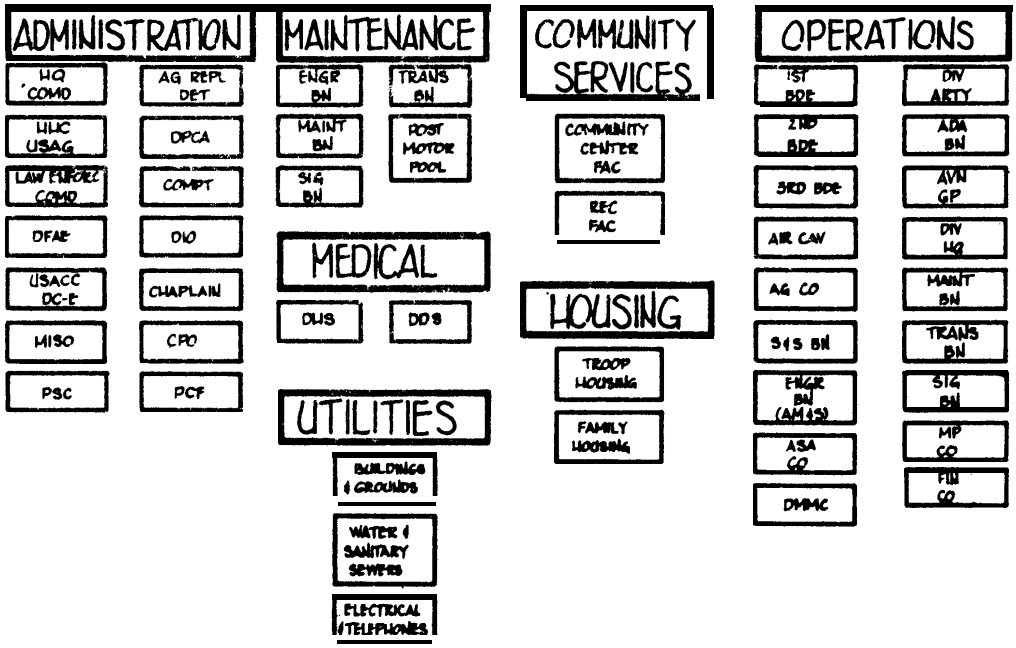

Figure 2–9. Example of units by functional groups.

2-22. Functional relationships.

a. There is always a desirable relationship among functions at an installation. The operations required to carry out the installation's mission determine this relationship. Using the facility categories identified in the installation's TERF, a predominant function should be established for each activity on the installation. Regardless of their current physical location, units and activities identified in previous steps should be clustered within major functional groups as shown on figure 2-9.

b. Based upon mission objectives. the operational activities of the installation are analyzed to establish how fictional categories currently are related As figure 2-10 illustrates, each functional will have a set of relationships with other functions. The closest most interdependent relationships are illustrated on figure 2– 10 with heavy arrows. These are the relationships which are most crucial to accomplishment of the installation's mission. Less critical, less interdependent relationships among functions are shown with thin arrows.

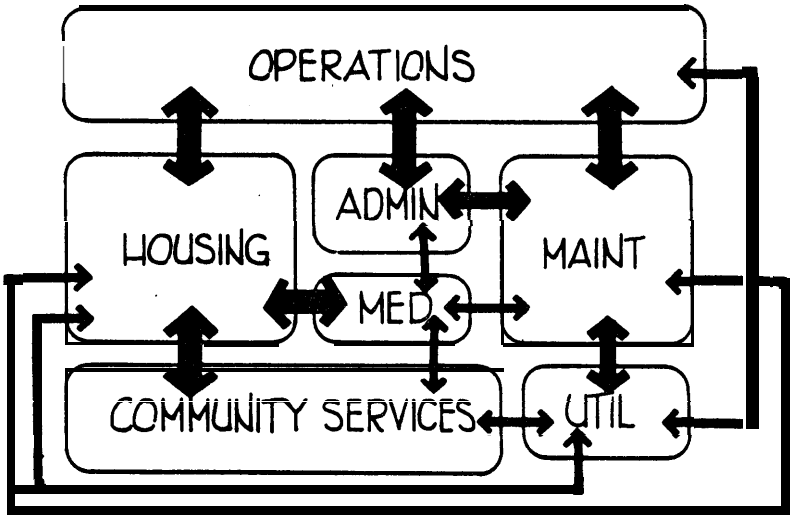

Figure 2–10. Example of functional relationships.

c. After existing fictional relationships are defined, those relationships which are most important to the mission may be determined based on operational requirements such as movement of personnel and equipment or direct provision of services. An exhibit should be prepared to show the ideal arrangement of functions to meet these requirements, as illustrated in the example on figure 2-11. This exhibit will be included in the Master Plan Report. This arrangement should reflect only the most effective organization of functions; it does not consider existing location of functions or other constraints. As part of the exhibit, the relative importance of relationships should be shown for use in subsequent analyses to convey clearly which are most important to the mission.

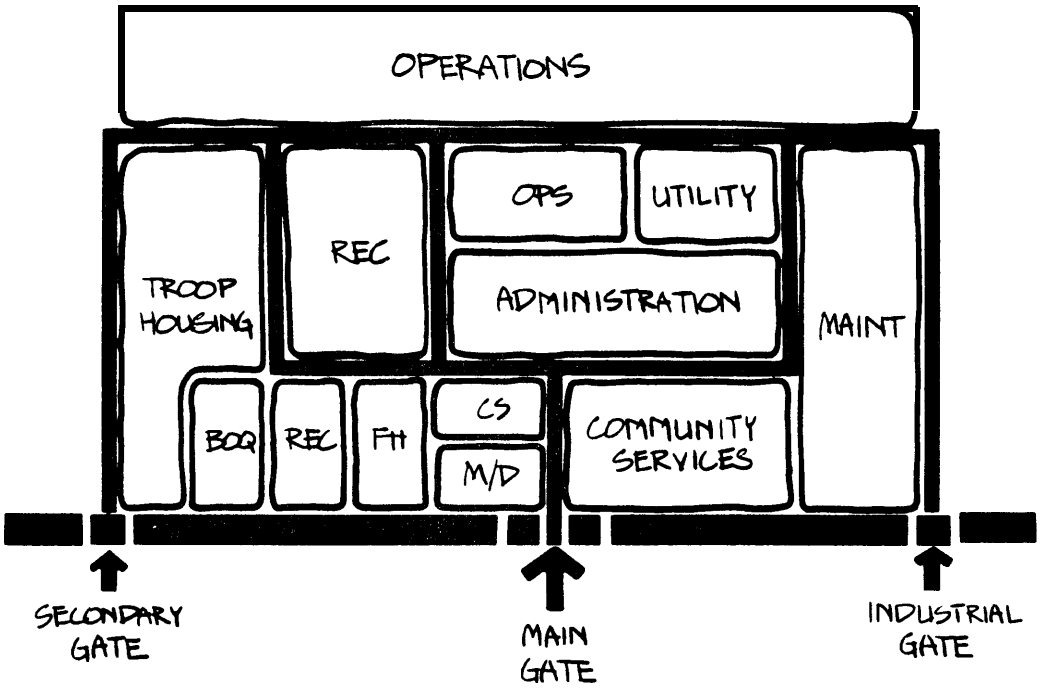

Figure 2–11. Ideal arrangement of functions.

CHAPTER 3
CONCEPT PLANS

3-1. Procedure

a. This step in the installation master planning process includes preparation of alternate concept plans for future development and selection of a preferred concept, known as the Concept Plan, to serve as the basis for preparation of the long-range plans for the installation. This Concept Plan presents the major land use areas, circulation system, and utility relationships proposed for the installation.

b. The Concept Plan conveys a functional and spatial framework for long-range development which responds to the requirments of the installation mission The Concept Plan is developed by analyzing the installation's rnission-derived functional relationships and facility requirements; by comparing ideal functional relationships with existing facilities and physical limitation by developing goals and objectives to be met; and by graphically developing an ideal spatial arrangement of functional land use areas which will accommodate both existing facility and program needs and long-range development requirements.

3-2. Needs and Constraints

The mission analysis described in chapter 2, section V, produced future installation requirements and an ideal arrangement of existing and future functions on the installation without regard for physical constraints or the location of existing facilities. Future requirements and the ideal functional arrangement will be brought forward into the concept stage for comparisons and synthesis to create the alternate concept plans. Likewise, chapter 2, section IV describes the process by which physical limitations are derived, yielding a map of buildable areas. The Buildable Areas map should also be used in the development of concept plans. These two elements, the ideal functional arrangement and the installation's buildable areas, describe the existing and future needs of the installation and the physical constraints within which those needs must be met.

3-3. Existing spatial relationships

a. The location of existing facilities at the installation creates a pattern of spatial relationships corresponding to the major functions at the installation. The pattern will show where similar or compatible functions are located together and where they are separated.

b. The existing spatial relationships should be diagramed as shown in figure 3-1. The diagram should be based upon the location of facilities as shown on the Existing Condition Maps and include all major functions of the installation. The general location of fictional areas are shown in terms of their relationship to each other. While the diagram is not to be a site-specific depiction of each facility, it should accurately portray the overall arrangement of functions. Where a function is located in more than one area the diagram should show each separately.

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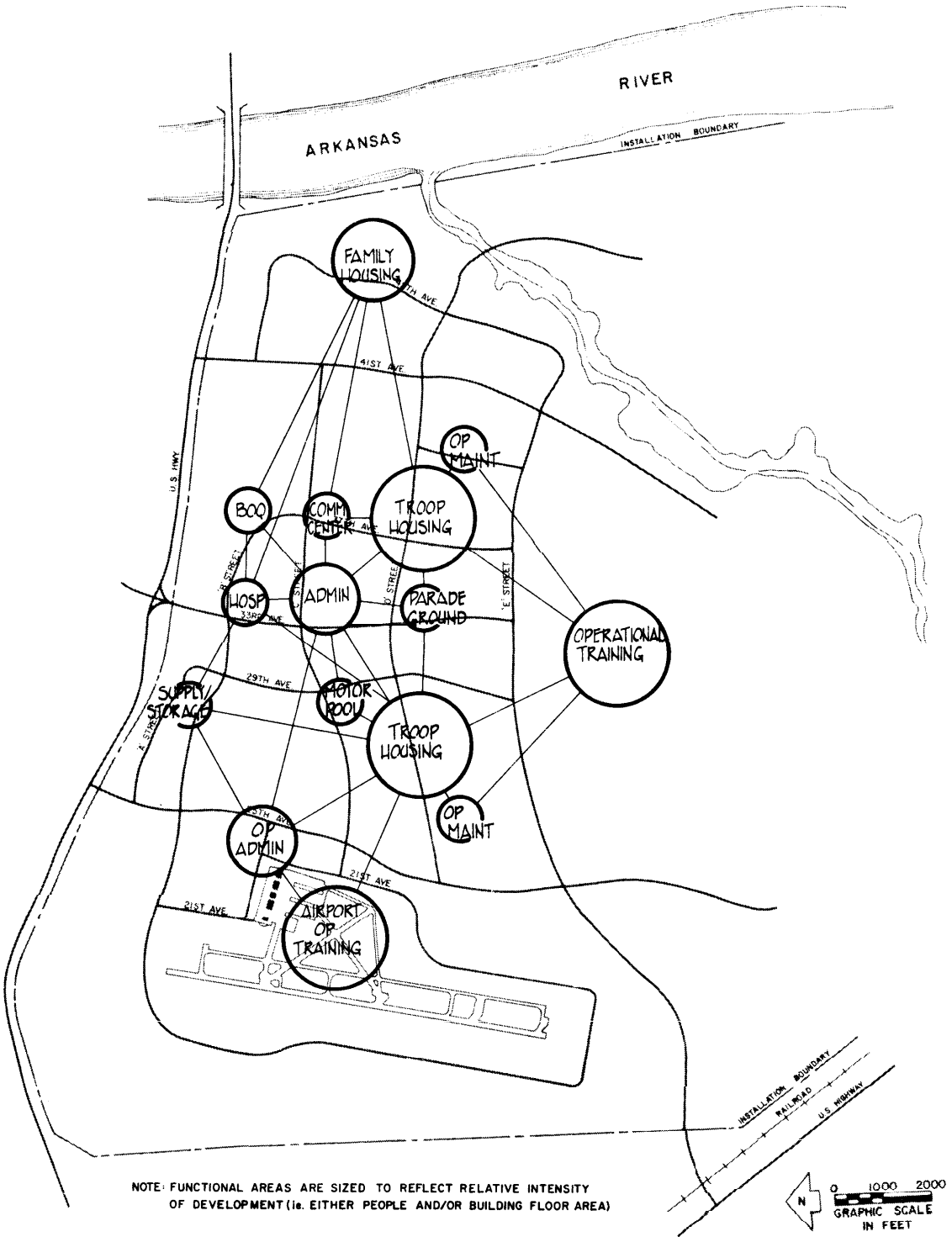


Figure 3–1. Existing spatial relationship diagram.

c. The existing spatial arrangement of major functional areas at the installation will be analyzed. including major tenant activities. This analysis identifies opportunities and constraints for future development resulting from:

- Fragmented and scattered functions.
- Difficulty in maintaining lines of communication,
- Incompatibility of adjacent land uses.
- Total land area limitations.
- Lack of transition areas for sensitive uses.
- Limited expansion of built-up areas.
- Inappropriate use of environmentally sensitive areas.
- Inefficient movement of material and personnel.
- Incomplete circulation facilities.

This analysis leads to the definition of specific problems in existing locations and in functional relationships which should be addressed in the Concept Plan. These problems should be documented in the Master Plan Report.

3-4. Synthesis

a. The synthesis step involves integrating the ideal functional relationships with existing spatial relationships. within the physical restrictions documented on the Buildable Areas map. This is accomplished by preparing one or more working diagrams of the most desirable future spatial relationships for the installation. These diagrams may reflect relocation of some functions. consolidation or expansion of some functions. or separation of incompatible functions. Each land area shown on the diagrams should be of sufficient magnitude to accommodate all future requirements for the function appropriate to that use. These requirements are based on the ASIP or TDA strength and developed as part of the mission analysis. plus a 25 percent allowance.

b. Figure 3-2 shows the procedure for calculating gross land area requirements for each land use type (barracks. administration. community facilities. etc.). This procedure allows a comparison of total needs with current availability and use. which in turn allows an identification of additional land area needs to accommodate the requirements. All available areas of the installation should be used to provide maximum long-range development capability. All of the development capability of the installation cantonment area should be incorporated while maintaining required training and maneuver areas.

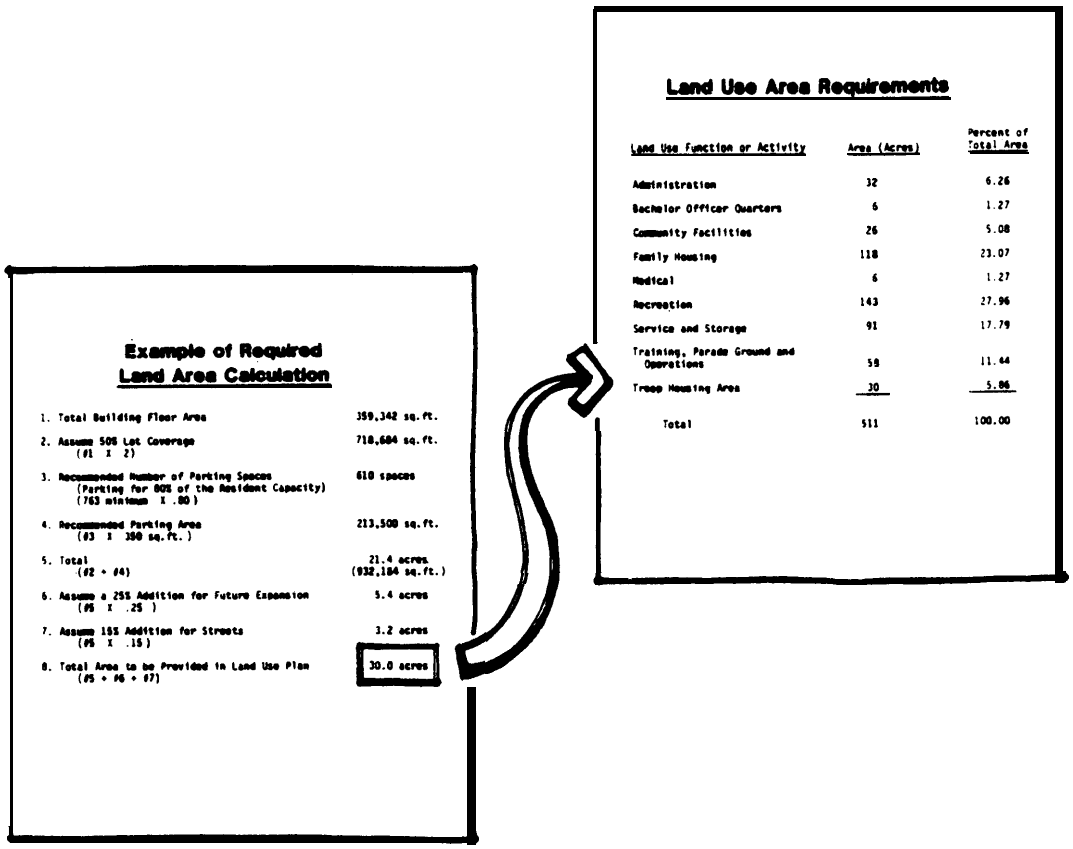


Figure 3-2. Method for determining gross land use area requirements.

3-5. Goals and objectives

a. Specific goals and objectives for future installation development will provide guidance for developing the alternate concept plans and standards for the evaluation of alternate plans. The goals and objectives should address broad functional and locational considerations for future physical development rather than specific facilities or sites. These goals and objectives also should be responsive to the particular combination of natural. man-made. and operational conditions at the individual installation.

b. The rationale for selection of specific goals and objectives is based on consideration of the installation mission and analysis of significant off-post and on-post conditions. Factors to be considered in identifying installation objectives should include:

- Need for increased operational capacities to carry out the installation mission.
- Resolution of functional land use difficulties.
- Correction of circulation and utility problems.
- Treatment of environmental concerns.
- Relationship to previous plans.
- Economic feasibility of development.
- Need to retain traditional or historic use areas.

3-6. Alternate concept plans

a. The alternate concept plans will depict generalized long-range development of the installation. including the arrangement of functional land use areas, major roadways. and utility systems. These concepts will be logical arrangements for physical components of the installation. They will be derived from the diagram of ideal spatial relationships. tempered by the reality of existing facility locations and the off-post and on-post environment. Each alternate may be based on a theme or point of emphasis to allow comparisons and tradeoffs later in long-range development.

b. The number of alternate concept plans to be prepared will be determined by the possibilities for different logical arrangements of the physical components of the installation. Generally. no more than three alternate concepts will be required unless a wide variety of future requirements is indicated. based upon a possible change in mission. However. in the initial stages of concept development, a greater range of alternates for a particular element (such as the circulation system or one or more utility systems) could be considered When there is no reasonable alternate for a specific element. each alternative concept plan should show that element in the single most appropriate configuration.

3-7. The Concept Plan

The Concept Plan is derived from the alternate concepts. The advantages and disadvantages of each concept should be evaluated against each other and against the ideal spatial relationship diagram. The intent of this evaluation is to determine which elements in each concept come closest to achieving that ideal. One alternate concept plan may be selected as the most appropriate. However. it is more usual to take the best elements of each alternate and combine them to form the Concept Plan.

a. At many installations. even after requirements to provide for the assigned strength are satisfied. additional land area will be available for development. If this is the case, the Concept Plan should depict maximum development potential predicated upon a functionally related extension of land use areas.

b. Concepts for circulation and utility service areas will also be incorporated as part of the Concept Plan. These concepts will be based on supporting the ultimate land use development at the installation. Figure 3-3 illustrates an example of a Concept Plan An illustration of the Concept Plan should be included in the Master Plan Report.

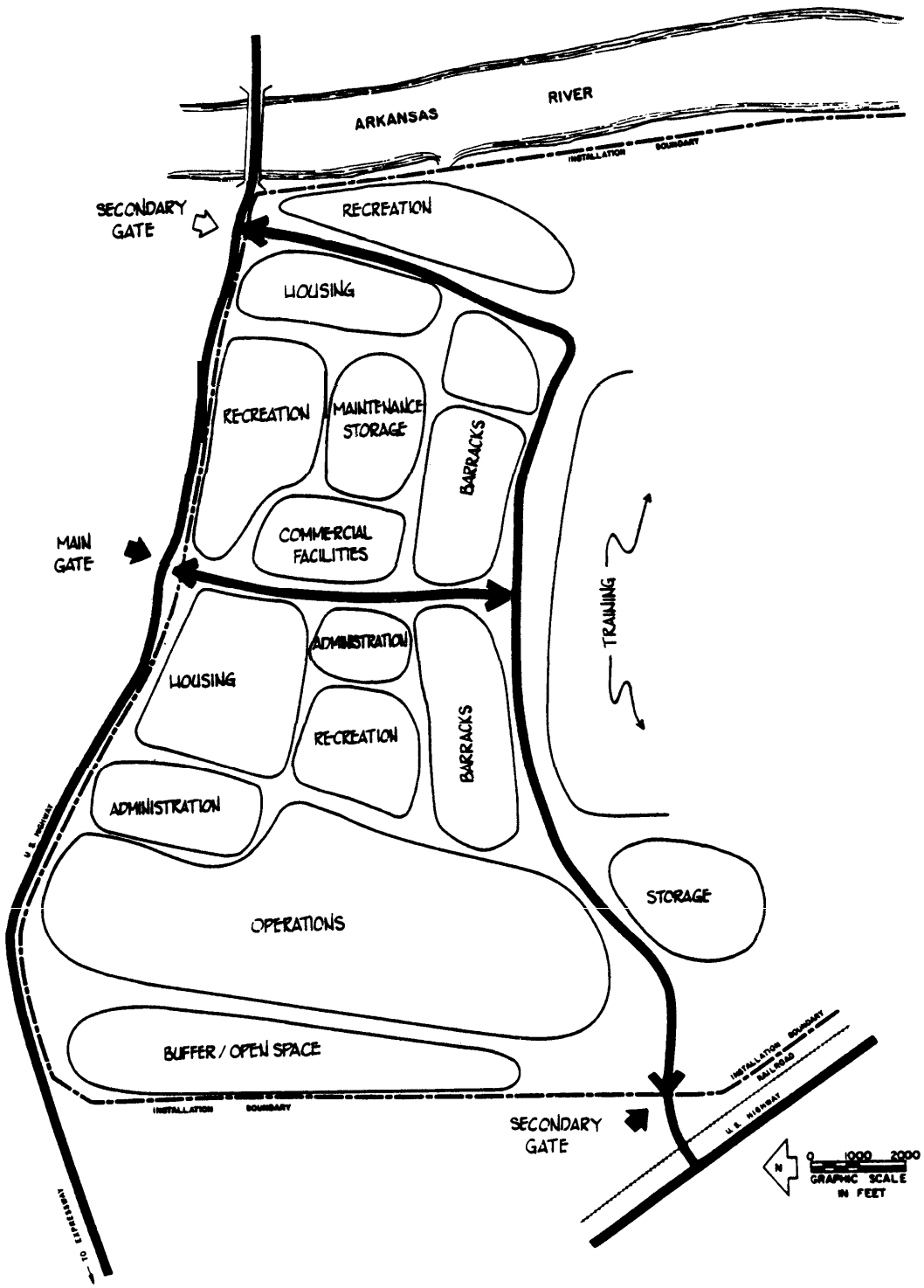


Figure 3-3. Concept Plan

c. The Concept Plan selected from the alternate concepts will be based on a particular rationale for achieving the installation-s functional requirements and objectives for future development. This rationale takes form during the evacuation of components of the alternate concept plans and their relationship to each other. Together with the previously developed goals and objectives. the rationale defines the installations policy for long–range development.

d. The Master Plan Report will include a description of the rationale for selection of the Concept Plan. The criteria used for establishing major land use relationships, the circulation system. and utility service areas will be defined with an indication of their relationship to develop ment goals and objectives. How the criteria are related to development limitations and requirements of the particular installation should be specified. Typical criteria include:

- Conformance to the installation's functional requirements.
- Ability to efficiently accomplish operations.
- Flexibility to respond to changing-conditions.
- Security for sensitive functions and control of access.
- Contribution to efficient communications.
- Compatibility of land use areas based on proximity and intensity of use.
- Accessibility of land use areas.
- Quality of life and pleasantness of the living and working environment.
- Separation of hazardous operations from populated areas.
- Efficiency in energy conservation by minimizing internal travel distance and by providing building locations which ameliorate local climate effects.
- Efficiency of utility service to serve all development.
- Removal of existing service constraints.
- Avoiding intensive development in environmentally sensitive areas.
- Maintaining compatibility with the character of adjacent land use.
- Assurance of operational safety clearances.
- Flexibility to respond to unforeseen long--range needs.
- Ability to maximize use of existing assets and facilities.
- Availability of additional property for acquisition.
- The compatibility of plan concepts with previous installation plans.
- Ability to undertake development in staged or phased construction.

3-8. Land use element

The Concept Plan will depict general locations for land use areas in relation to existing development patterns and major constraints as identified in the data analysis. Within the limitations posed by existing development and the environment. there generally will be more than one arrangement of future land use which will satisfy the functional elements of mission requirements. Land use relationships should achieve the most efficient arrangement of functions. resolve existing problems, and provide a logical and desirable location for all future requirements. The land uses shown should correspond to the major functions depicted in the spatial relationship analyses. The areas identified for each land use may be approximate in the size but the relative locations of the proposed areas must clearly convey the locational relationships between land uses. installation boundaries. and major site features.

3-9. Circulation element

The movement of people. goods. and services between various functional areas is critical to an installation's efficiency. The Concept Plan therefore should include a road network that is convenient, safe, and in scale with Its intended use, A conceptual system of major roadways will be designed to serve the land use arrangement presented in the Concept Plan. The circulation concept should focus on major vehicular routes. including existing major **roads to** be retained. roadway extensions. new alignments. and major access points to the installation as shown in figure 3–3. Secondary and minor roadways should not be included unless they are required to resolve a serious functional deficiency affecting the overall land use arrangement.

3-10. Utility service element

Utility service must be provided to support the land use arrangement in the Concept Plan. This may require the extension of service areas or removal of major constraints in the existing system to serve the future population level. The Concept Plan should indicate the proposed areas of required utility service in relation to the existing areas of service and major treatment or generating facilities as illustrated in figure 3-3. The Concept Plan should also indicate future service needs. particularly in locations where service is not provided or is limited by existing deficiencies. A detailed engineering analysis is not needed at this point However. the location or scope of any major system improvements necessary to serve the conceptual land use pattern should be specified.

CHAPTER 4
LONG-RANGE PLANS

4-1. General plan considerations

a. The long-range plans serve as guides for overall. long-term physical growth and change at the installation. The long-range plans are composed of a minimum of three interdependent elements: a Land Use Plan a Circulation Plan: and a Utility Service Plan. Other long-range plans may also be prepared for special topics such as wildlife management or historic preservation. However, the three plans discussed here provide the overall framework of the Installation Master Plan. The long-range plans are comprehensive in that they cover the entire installation and also because they reflect all of the physical systems which support the installation. These plans must be flexible enough to respond to future. unforeseen needs without losing their essential purpose. yet they must be detailed enough to clearly convey and maintain the appropriate spatial and functional relationships for the installation. The long-range plans should provide efficiency in the arrangement of functions. provision of services, and use of existing assets. The plans also should present a clear and logical sequence of development. Finally, the long-range plans must respond to the particular development problems and needs of the installation while conforming to general planning criteria and military requirements.

b. The long-range plans are concerned with existing and future land uses and the major circulation elements and the utility services necessary to support those land uses. Therefore. the plans will address the location of major land use areas. designation of major elements of the circulation system, and determination of utility service requirements. The process of preparing the long-range plans will be largely one of refining and shaping the proposals outlined in the selected Concept Plan. Through out the process, the primary objective should be to maintain the desired spatial relationships between functional areas while fitting the arrangement of land uses to the installation site.

c. Goals and objectives for the development of the installation continue to play a major role in this step of the planning process. As adjustments in the Concept Plan are made to reflect installation site features. the previously determined development goals and objectives provide guidelines to maintain consistency with the Concept Plan. Modifications to the goals and objectives may be required to respond to new information discovered through the planning process. Any modifications should be documented.

d. The nature and extent of environmental limitations and constraints identified in the data collection and analysis stage should remain in the forefront as the long-range plans are developed. The definition of specific land use areas and supporting circulation and utility system must be sensitive to hazardous areas and clear zones. historic or archaeological resources. unstable soils. steep slopes. water areas and wetlands. endangered species habitat, and air and noise pollution.

e. The long-range plans are a function of installation mission and requirements. The land use relationships which emerge should enhance the installation mission and provide needed capacity and flexibility. To ensure that the previously determined the functional relationships are carried forward into the long-range plans, the Concept Plan should provide the basis for the more detailed arrangement of land uses. Where difficulties are found in the process or refining the Concept Plan. the arrangement of uses may be altered to alleviate the problem.

4-2. Land Use Plan

a. The Concept Plan is refined to arrange specific land uses in the most desirable configuration. This configuration. This configuration becomes the Land Use Plan. As the Land Use Plan is prepared. potential transportation and utility support needs also must be considered. The Land Use Plan should be portrayed in an exhibit similar to the example given in figure 4-1. This exhibit will be included in the Master Plan Report. A narrative description of the rationale for the Land Use Plan also is included in the Master Plan Report along with a description of the criteria used for delineating land use areas. The land use arrangement should relate to installation development objectives and to key functional and spatial relationships.

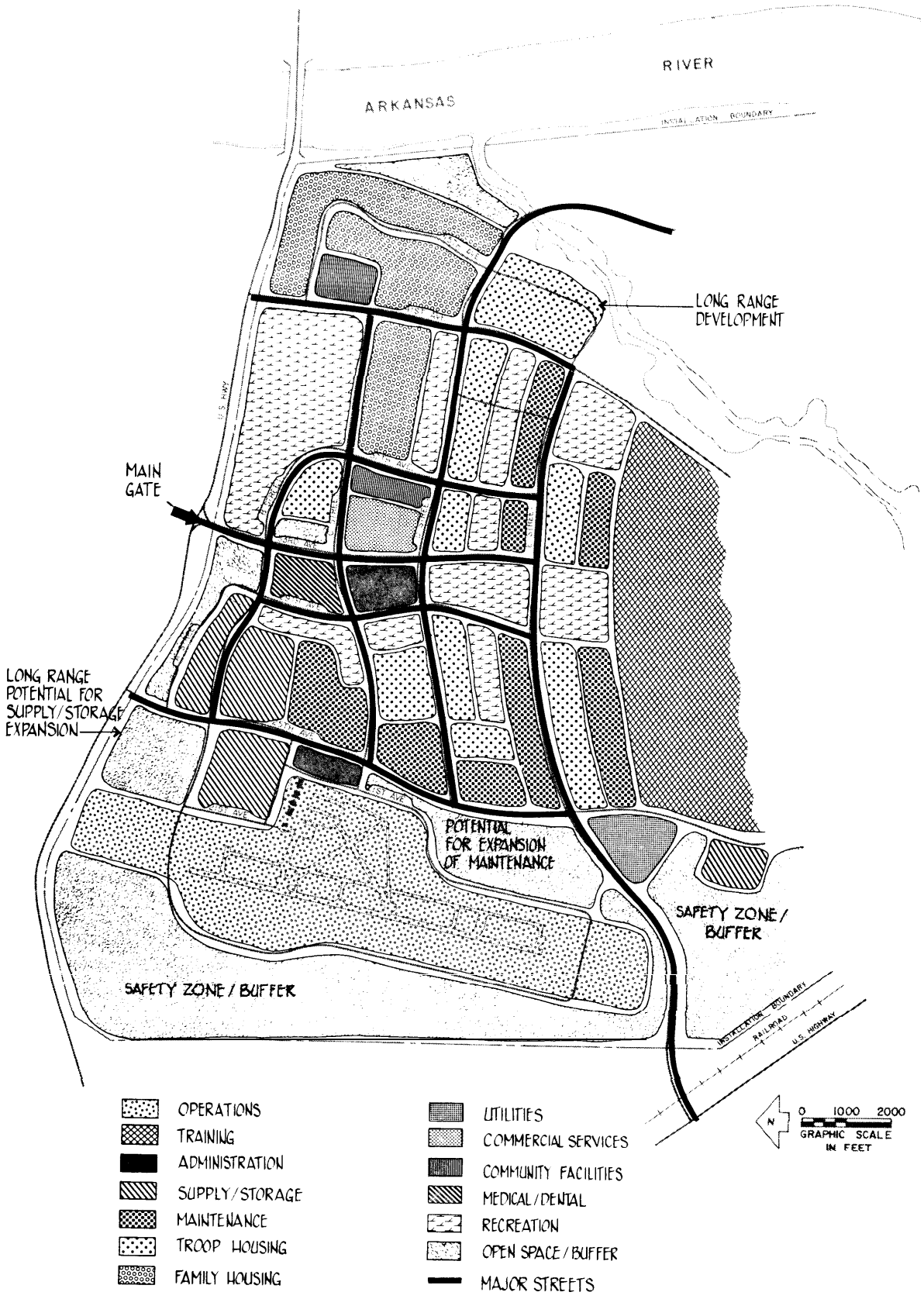


Figure 4–1. Land Use Plan.

b. The land use arrangement should reflect the influence of the installation's natural setting, the off-post community envimnment, and the mission and functions of the installation. As land use areas are delineated, the following conditions should be sought.

- A compact arrangement of land uses for the built-up area of the installation.
- Maintenance of open areas outside the built-up area for training activities, maneuvers, and required operational clearances.
- Separation of uses with different intensity of activity.
- Grouping of compatible functions in areas providing for multiple use.
- Adjacent locations for land uses with important fictional relationships.
- Conformance with operational safety clearances and noise criteria.
- Allowance for required expansion within land use areas.
- Available capacity of the circulation and utility systems to serve high activity land use areas.
- Use of natural features and terrain to provide an attractive setting for living areas and other community functions.
- Convenient access to community facilities for on-post and off-post population.
- Separation of functions requiring special security considerations.
- Accessibility to primary roads for land uses generating high traffic volumes.

c. The Land Use Plan must consider the installation's maximum development potential, over and above requirements based upon planned strength under the ASIP. At many installations, after requirements to provide for the planned strength have been met, excess land area will be available. The Land Use Plan will designate appropriate long-term uses for any excess land areas. Designation of these areas should be predicated upon a continuation of the assigned mission of the installation and expansion of activities functionally related to this mission Designation of land use areas for long-term development should be consistent with the general functional and environmental criteria for land use relationships. The designation of areas for long-term development also will be a logical extension of the proposed development pattern designed to meet the A SIP requirements and should lend itself to staged implementation. Development areas to meet A SIP requirements and long-range potential should not be intermixed

4-3. Guidelines for specific land use types

a. Administration. Facilities which are primarily used for administration, including post headquarters and general office functions, should be centrally located within the built-up area of the installation to be accessible to all major activities. The location should have a direct route to the main entrance and be accessible to other major fictional areas on the post. A location where natural features or site development provides a visually prominent setting or vistas is desirable.

b. Commercial services and community facilities. These facilities include both commercial services such as the post exchange and commissary and community services of a non-commercial nature such as the library, chapel, and craft workshops. Where practicable, commercial services and community facilities should be grouped in one or two notes to provide for multiple use of facilities and convenient access from housing and employment areas. A "community center" of this nature. should have good access from major roadways yet should be within walking distance of major troop housing areas. The center should be close to the main entrance, with a direct route for use by service vehicles as well as by the off-post population served by the installation. Sizable areas suitable for vehicular parking and internal circulatiom within the center will be required. Consideration should be given to providing an attractive setting for the center with adequate area for separation of more intensively used activities from those adversely affected by high activity levels. More detailed guidance for community centers may be found in TM 5-803-6.

c. Medical and dental The location of medical and dental facilities, including hospitals, clinics, and supporting laboratory facilities, should be consolidated in their primary service area Where the predominant function is to serve off-post patients, these activities should be located away from other major activity areas at the installation, but with direct access to the main entrance. Where the facilities primarily serve on-post activities, their location should be accessible from other major functional areas and housing areas. but separated from more intensive activities. Access from major roadways providing internal service to the installation is necessary and proximity to the main entrance is desirable to accommodate visitors.

d. Training. Training facilities include classroom buildings and other indoor facilities, as well as outdoor maneuver and range areas. The indoor facilities should be accessible to but separate from troop housing areas for the convenience of personnel using the facilities. They should also be accessible to any supporting supply, maintenance, or administrative facilities. The maneuver and range areas should be well separated from the built-up portions of the installation with direct access routes to troop housing and maintenance areas. Location of maneuver areas should be related to the character of the installation terrain to provide appropriate training capability.

e. Supply/storage and maintenance. Supply/storage and maintenance land uses include facilities engineering, quartermaster, transportation, motor pools, and warehousing areas. These uses require level sites with adequate space for outdoor storage and access for service vehicles.

Where supplies are to redelivered by rail, the location should have rail access or the potential for such access. While the location should be accessible to all portions of the installation, it should be separated from housing and community service areas.

f. Manufacturing and production. Manufacturing and production activities require extensive land areas with level terrain to accommodate equipment, storage, and service areas. These uses should have a direct route to an industrial or service entrance to accommodate service and employee traffic. Also, rail access will usually be required These uses can be separated from other installation functions, although internal access to supply and maintenance facilities is desirable. For facilities with sizable employment, consideration should be given to locations which have good access to community and medical facilities. Facilities which require special security should be grouped together and appropriately separated from adjacent uses.

g. Research development and testing. These activities share many characteristics with manufacturing and production facilities and have similar locational requirements. Uses which involve the handling or storage of hazardous materials should be well separated from other built-up areas of the installation.

h. Housing. Housing areas should be accessible to related cammunity facilities, medical facilities, recreation, and training areas. They should be separate from other intensive areas, but accessible using the internal installation roadway system In addition, troop housing and family housing have specific locational requirements.

(1) Troop housing. Troop housing areas include living quarters for enlisted personnel, non-commissioned officers, and commissioned officers, as well as supporting service, administrative, storage, and supply facilities related to housing. Troop housing should be accessible for training facilities and provide adequate area for outdoor recreation activities and vehicular parking Locations which allow the grouping of troop housing and which are within walking distance of commercial services and community facilities are desirable. Primary access to troop housing areas should be separate from that to family housing areas.

(2) Family housing. Family housing areas should be close to dependent schools, family recreation facilities, and community support facilities. Locations which have visually attractive settings are desirable to foster the feeling of a residential environment.

i. Operations. Operations activities such as airfields have specific requirements based upon type of aircraft, flight patterns, and activity levels. Aviation facilities should be located to maintain necessary clearances and approach zones. Detailed criteria for planning aviation facilities can be found in TM 5–803-4 and DOD Instruction 4165.57.

j. Recreation. Passive and active recreation areas should be located in areas removed from training, operations, or maintenance activities. Recreation uses relate well to housing areas and commercial service arid community facility centers and may be effectively co-located with these uses. Open areas used for parades or reviews should be located in highly visible and readily accessible locations, preferably associated with the installation's primary administrative activity center.

k. Water areas. These areas should be shown on the Land Use Plan with an indication of their relationship to future kind uses.

1. Reserved land/buffer. Reserved areas may be designated to separate incompatible uses, to protect fragile ecosystems, as a safety measure around operational or training uses, to discourage construction in areas with severe physical limitations, or to provide a visual or auditory screen. These reserved or buffer areas should be carefully established, with the importance of their purpose clearly documented so that they will not be encroached upon in the future.

4-4. Circulation Plan

a. The Circulation Plan identifies a desirable system or major roadways which provides a coordinated and comprehensive system of access for the installation. The Circulation Plan identifies both existing and proposed roadways to serve the previously developed land use pattern shown in figure 4-1. The designated function of roadways should be consistent with criteria for roadway classification (TM 5-822–2), including primary, secondary, and tertiary. Where specifically required for the particular needs of the installation, other minor roadway types, such as patrol roads, should be included. An exhibit showing the Circulation Plan is required in the Master Plan Report Figure 4-2 gives an example of this exhibit. Where practical, the Circulation Plan may be combined with the Land Use Plan as a single exhibit.

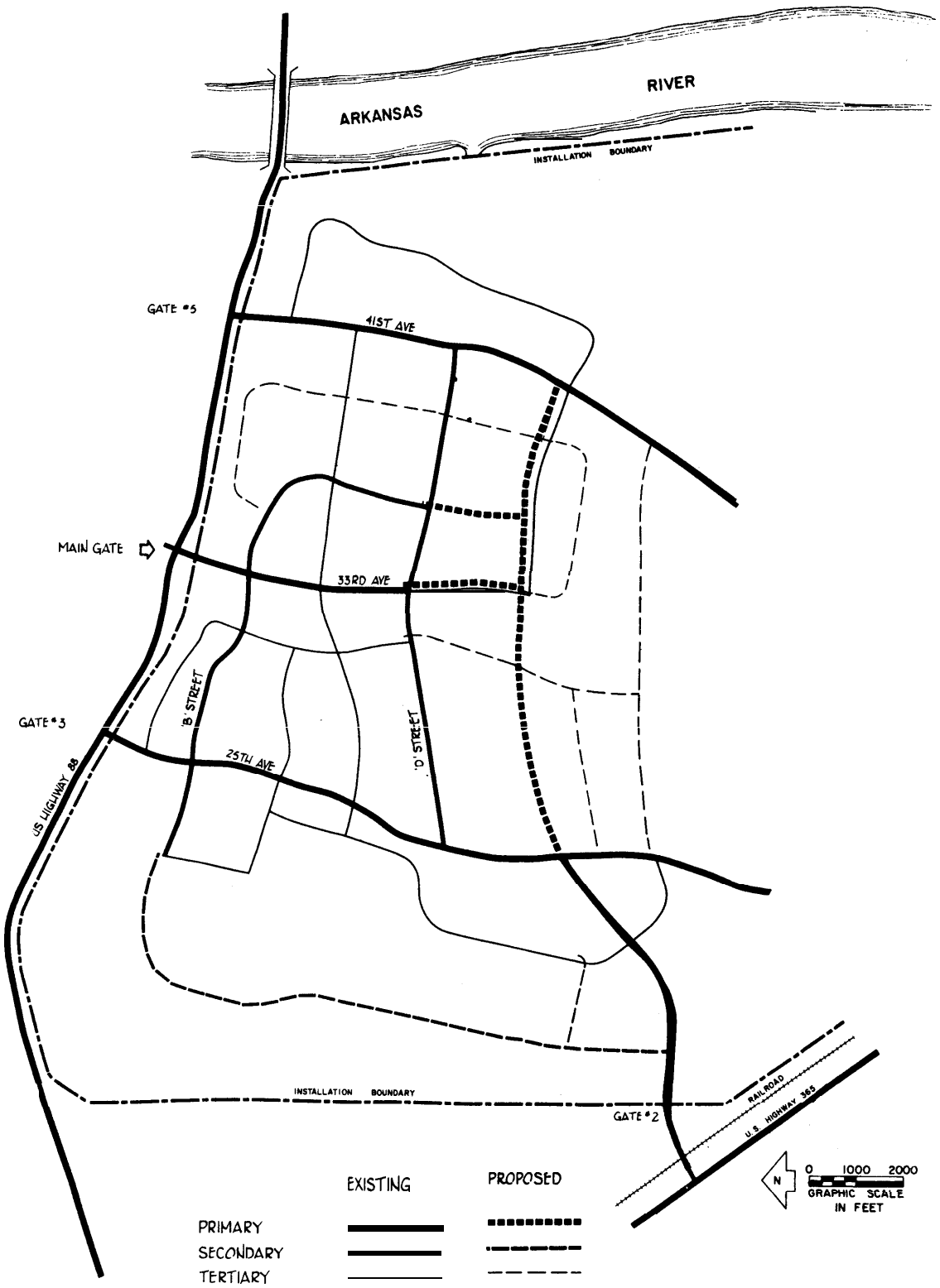


Figure 4–2. Circulation Plan.

b. The Circulation Plan ideally will respond to travel desire lines which link activities and correspond to major fictional relationships and land use intensity. Major roadways should separate rather than bisect functional use areas. The Plan should attempt to alleviate traffic congestion at sensitive sites such as family housing, schools, and hospitals and should seek to reduce the impact of noise and air pollutants in areas generating high traffic volumes.

c. The general location and alignment of the roadway system should be suited to the natural features of the installation and should respect environmental limitations. The following should be avoided

- Areas of steep slope, where roadway construction will require excessive cut and fill.
- Areas of extensive rock outcropping.
- Disruption of major wooded areas.
- Disruption of major natural drainage channels.
- Wetland areas and extensive areas of unstable soils.

d The system should retain existing roadways and facilities when possible. The use of existing streets as one-way pairs, with improved channelization or with other modifications to increase capacity, should be considered before new roadways are proposed

e. The Circulation Plan should provide direct access from the installation to the surrounding highway network through the main entrance (and secondary entrances if appropriate to the size and function of the installation). Where major changes are proposed in the surrounding highway network, including construction of a new facility or major realignment of an existing facility, the Circulation Plan will include recommended changes in the location or extension of on-post roadways to maintain access to the regional highways.

f. Adequate space for off-street parking, based on current DOD criteria, should be provided within each land use area to eliminate the need for on-street parking. Where an exisitng lack of parking causes functional difiiculties, the Circulation Plan should offer opportunities to improve parking facilities by changes in the surrounding roadways. Major roadways should not be planned to accommodate on-street parking, unless no alternate solution can be found to meet a critical fictional need Groupings of compatible activities within appropriate land use areas should be considered to maximize use of multi-purpose parking facilities.

g. Where frequent access by service vehicles is required, such as supply and maintenance facilities, the Plan should provide sufficient space for internal service access and loading facilities so that roadways are not used for vehicular storage and loading. Access to individual off-street service and loading areas should be from local or secondary roads rather than major roadways. The Circulation Plan should provide direct routes from the main or secondary entrance to land use areas requiring frequent service, with vertical and horizontal clearance to accommodate truck traffic. These routes should not be near land uses sensitive to vehicular noise and exhaust emissions.

h. The Circulation Plan should provide for secure access points to the installation and, as necessary, to individual land use areas involving hazardous or restricted operations. These access points should be located in areas with enough space to allow security clearance facilities to function without impinging on through traffic movements. Roadways which are likely to be frequented by visitors and off-post population should not be located close to restricted areas. The effects on area transportation in closing the post to unauthorized traffic during emergency conditions should be considered.

i. Generators of significant pedestrian traffic such as community centers, schools, and recreation facilities require safe and convenient walkways and bikeways connecting them with housing areas and other functional activities. The Circulation Plan should ensure that sufficient right-of-way is available to accommodate pedestrian walkways with adequate separation from vehicular traffic along major roadways.

j. At installations where rail access is necessary to provide for movement of troops or material. the Circulation Plan should identify the existing rail system and any changes required to accommodate projected traffic relative to the proposed location of functions. Locations of new tracks should not require disruption of existing operations and should minimize conflict with vehicular traffic at railroad/roadway crossings. Removal of under-utilized rail facilities should be considered to improve land use relationships or circulation.

4-5. Utility Service Plans

a The Utility Service Plans consist of graphic displays prepared for each major utility system servingthe installation The display for each utility will illustrate the extent of the system needed to meet the service requirements of the land use areas in the most efficient manner. These displays resolve problems identified for each existing utility system and support the Land Use Plan for long-range development.

b. The Utility Service Plans identify improvements to the trunk systems, including general location and capacity of extended main lines; general placement and capacity of intermediate equipment; and type and general placement of other new or expanded main elements if required The Plans will be consistent with the appropriate technical manuals and bulletins for each utility system and will also

- Retain, to the maximum extent possible, existing facilities to meet future requirements.
- Designate future service areas to maximize use of available capacities.
- Expand existing facilities where cost effective to provide additional service.

Allow for reasonable expansion of land use areas.
- Provide adequate capacity to accommodate peak demand periods.

c. Semite area boundaries should be graphically portrayed for each system serving the installation. The general location of all major utility trunk lines and services necessary to serve future development should be shown. More than one exhibit may be necessary for clarity; if so, all such exhibits will be included in the Master Plan Report A description of the analytical process used to develop the Utility Semite Plans also will be included in the Master Plan Report. An example of a sanitary sewer service plan is illustrated on figure 4-3.

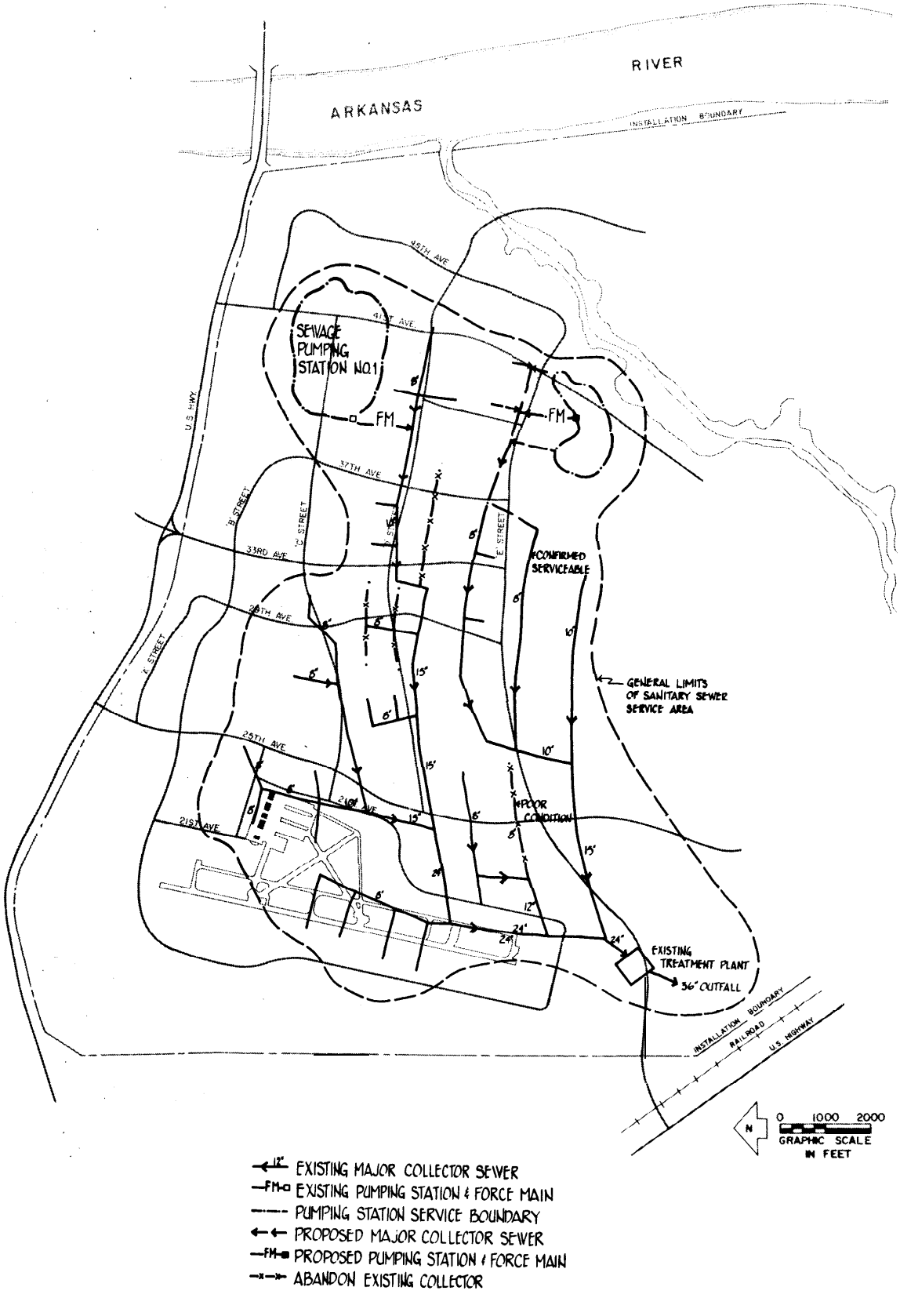


Figure 4-3. Sanitary sewer service plan.

CHAPTER 5
ENVIRONMENTAL ASSESSMENT

5-1. Assessment elements

The Environmental Assessment (EA) consists of three elements. These elements are (a) an analysis of the anticipated environmental impacts of implementation of the long-range plan; (b) identification of appropriate mitigation measures; (c) and documentation of the results of this analysis in the Master Plan Report

5-2. Analysis methodology

a. Each of the environmental factors related to the installation and identified by data collection and analysis should be re-evaluated in light of the long-range plan. This evaluation will consist of:

(1) Identification of those environmental factors which are most likely to be sensitive to physical changes on the installation.

(2) Identification of the probable short-term effects of Plan implementation on these sensitive factors.

(3) Identification of the probable long-term effect of Plan implementation on these sensitive factors.

b. All previously prepared environmental documents will be reviewed to ensure the accuracy and completeness of the above evaluation.

c. The severity and significance of probable impacts then should be determined for each environmental factor being evaluated The results of this evaluation should be recorded either in a narrative' form in a table with brief accompanying notes.

d After probable impacts have been identified and the level of impact severity determined, mitigation measures should be considered The nature of these measures will depend upon the type of environmental impact anticipated and the nature of the Plan proposal which will cause the impact Mitigation measures to be considered include

(1) Reconfiguration, reorienation, or relocation of the incompatible land use or facility. This could require an alteration of the Land Use Plan and if so, most likely would have been accomplished during the planning process.

(2) Identification of special measures to protect threatened resources. These measures might include

Noise attenuation provisions such as berms, walls, or soundproofing of buildings.

– Special construction techniques to prevent or minimize stormwater or wastewater runoff into receiving streams.

Landscaping provisions to prevent erosion, provide screening or enhance natural or cultural assets or vistas.

- Designation of no-development areas to protect archaeological sites. endangered species habitat, virgin forests, wetlands, or former landfill areas for encroachment.

Identification of the need, prior to Plan implementation, for more intensive study of one or more environmental conflicts.

5-3. Documentation

The results of the EA process will be documented and included in the Master Plan Report The environmental documentation should be brief but complete in that all concerns, regardless of level of impact, must be addressed The documentation may be completely in narrative form; however, it is often useful to prepare and include in the Report a matrix similar to the example given in figure 5-1. If a matrix is used then the narrative need only address those environmental impacts which are significant and for which mitigation is required The appropriate mitigation measures may require special attention in the development of the General Site Plan (see chapter 6). The Master Plan EA must lead to either a Finding of No Significant Impact (FNSI) or a finding requiring the preparation of an Environmental Impact Statement (EIS). The format for the EA finding will be in accordance with AR 200-2.

a. The FNSI will briefly describe the reasons why the Master Plan will not have a significant effect on the human environment and will not be subject to an EIS.

b. The finding requiring the preparation of an EIS will be stated in the EA. However, the EIS itself will be separate document and a separate work effort from the Master Plan.

c. The Master Plan Report is the overall assessment for the installation providing a framework for the project or program EA as required by the program development regulations. Site-specific EAs for a project or program will reference pertinent data from this Master Plan EA.

ENVIRONMENTAL FACTOR	LEVEL OF IMPACT				MITIGATION		COMMENTS
	NO NEGATIVE IMPACT	MINOR IMPACT	MODERATE IMPACT	SEVERE IMPACT	NEEDED	POSSIBLE	
Historic Resources							
Archaeological Resources							
Population Density/Trends							
Regional Development							
Transportation Systems							
Cultural Patterns							
Economic Conditions							
Air Quality							
Surface Water Quality							
Groundwater Quality							
Sanitary and Solid Waste Disposal							
Pesticide and Herbicide Use							
Aircraft & Operations							
Explosives Handling and Storage							
Industrial, Nuclear, or Other Hazards							
Topography and Soils							
Trees and Other Vegetation							
Streams, Floodplains, and Wetlands							
Endangered Species							
Noise							
Odor							
Land Use Relationships							
Community Facilities							
Recreation							
Other:							

Figure 5-1 Example environmental assessment matrix for long range plan evaluation.

5-4. Use of the assessment.

The EA process and appropriate findings will be documented and included in the Master Plan Report The EA will continue to be used as a reference as the General Site Plans are developed and as specific projects are scheduled for construction. Should major, irreconcilable adverse environmental impacts be identified. the long-range plans (Land Use Plan. Circulation Plan. or Utility Service Plans) should be reviewed for possible revision prior to incurring those impacts.

CHAPTER 6
FUTURE DEVELOPMENT SITE MAP

0-1. Basic principles

a. The Future Development Site Map shows the location of all proposed buildings and facilities identified in the TERF to support the mission of the installation. The manner, content, and symbols used to prepare this standard size map is contained in TB ENG 353. This chapter describes the procedures to be followed in siting new buildings and facilities on the installation to ensure that the proposed sitings are in accordance with the policies and plans of the Master Plan Report.

b. The siting of new facilities is to be governed by the following basic principles

(1) The location of all proposed installation buildings and facilities should be coordinate regardless of funding source or responsible agency.

(2) The functional and spatial relationships established in the Land Use Plan should be preserved.

(3). Flexibility must be maintained to meet changed requirements within land use areas.

(4) Conflicts with existing facilities should be prevented and compatibility with adjacent uses should be sought.

6-2. Methods

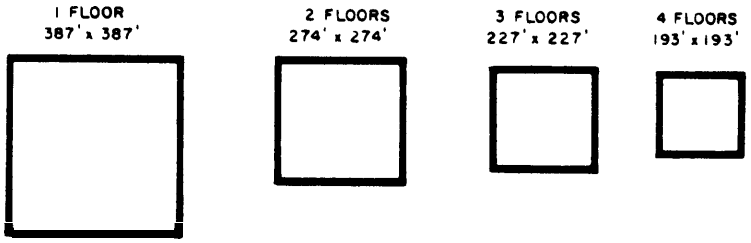
a. Preparation of the Future Development Site Map includes the following basic steps: a review of the previously developed Land Use, Circulation, and Utility Service Plans; summarizing all future building and facility require ments; developing “footprints” of proposed facilities; and locating these “footprints’* on the plan sheets based upon site planning principles and considerations. This process focuses on the location and spatial arrangement of individual buildings and facilities within established land use areas.

b. When preparing the Future Development Site Map, maximum use should be made of Existing Condition Maps, plans, and other special studies. Existing conditions maps, especially the Development Constraint Map, provide detailed information about the installation. This includes information relating to existing buildings (permanent, semipermanent, temporary), topographic features, and development constraints such as quantity safety distance arcs, noise contours, or floodplain. The Land Use and Circulation Plans, as discussed in chapter 4, define the proposed functional land use relationships as well as the major elements of the circulation system.

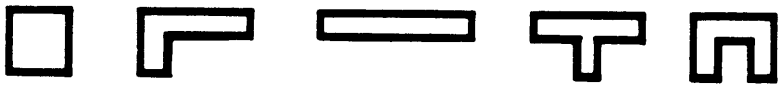
c. The primary source of building and facility requirements is the TERF. The TERF. identifies additional space requirements which have been developed based upon standard Department of Defense space allowances and planning criteria. Using the space requirements identified in the TERF, a list of additional facilities by category code should be prepared. This list should identify the scope of each project and indicate whether it is an addition to an existing facility or construction of a new facility. This summary should include all long-range and short-range facility requirements regardless of funding source of responsible agency.

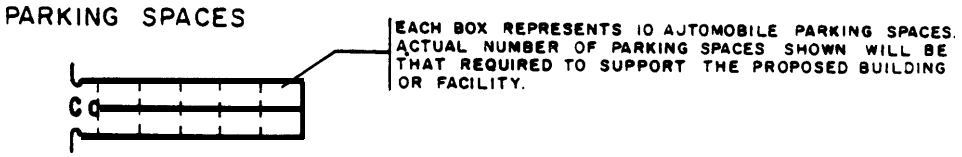
d. The next step involves the translation of the various facility requirements into typical building “footprint” to be shown on Future Development Site Map. A “footprint” is a representation of the proposed facility in plan view. The building “footprint” does not need to be based upon detailed facility planning or design, but should represent the size and shape of a typical facility of the type proposed (see figure 6-1). For a one-story building, the “footprint” will reflect the entire square footage of the required facility. For multi-story buildings, the area of the " footprint’” will be in proportion to the number of floors relative to the total square footage of the building. A building” footprint” can be approximate or exact depending on the information available. Projects identified in the short-range Military Construction, Army (MCA) program will probably have more detailed information available. Standard building designs have been identified for certain types of structures and should be used when appropriate. Other facilities shown on the Future Development Site Map include new roads, parking lots, storm drainage retention basin, electrical substation, ball fields, etc. These facilities also have typical “footprints” which are reflective of their function and use.

"FOOTPRINT" FOR A 150,000 SQ.FT. ACADEMIC BUILDING WITH EITHER 1, 2, 3 OR 4 FLOORS.



"FOOTPRINT" FOR A 20,000 SQ. FT. ADMINISTRATION BUILDING WITH VARIATIONS IN BUILDING CONFIGURATION.





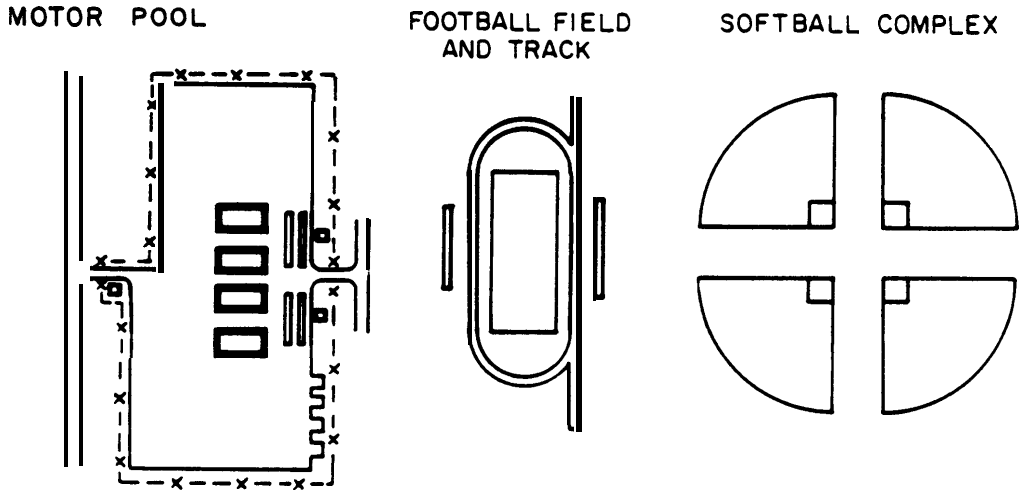


Figure 6-1. Example of "footprints" at 1"=400'.

e. beating the “footprint” of all proposed facilities and buildings on the Future Development Site Map is the next step. This step is illustrated on figure 6-2. Facilities which have the most critical loctional requirements related to the installation’s mission should be sited first, followed by the remaining facilities. The location of facility’s “footprint” within an appropriate land use area is based partly upon the functionai requirement for that facility and the siting criteria contained in paragraph 6-3. The analysis involved will vary depending upon the complexity and scope of the facilities being sited The siting of a single building requires only minimum analysis whereas the siting of an entire complex of buildings may require development and analysis of alternative site plans. The selection of a location from among several alternates should be based on achieving the most desirable fictional relationships. As building locations are determined, site access, off-street parking areas and other site-supporting features should be determined.

‘ L .

6-3. Siting considerations

a. In locating the "footprints" of proposed buildings and facilities on the Site Map, generally accepted site planning principles should be followed. Though siting considerations will differ depending upon the type of project, the following items should be considered

(1) Building relationships.

(a) Buildings should be related in groups. A major challenge is the introduction of new buildings within existing building groupings. Essential considerations include the provision of site access; separation of auto, pedestrian and service traffic; the functional and visual arrangement of space between buildings proportion to an increase the establishment of a compatible building scale architectural character, and provision for future growth and expansion.

(b) Distance between buildings should be related to the height and bulk of surrounding structures in addition to providing the minimum spacing to meet fire protection standards. The distance between buildings should increase in height and bulk of adjoining buildings.

(c) Facilities which serve large numbers of people should be sited for maximum visibility and exposure within a building grouping. Also, facilities with intensive use should be oriented so that the points of access will be readily identifiable. Visually prominent sites should also be considered for buildings of symbolic importance, such as the Post Headquarters or the Chapel.

(d) The open space network of a building group should be coordinated with the open space system of the installation

(e) Cluster development patterns which facilitate joint use of common areas should be considered

(f) Proposed buildings and facilities should be sited to ensure compatibility with adjacent land uses.

(2) Roadways, site access, and parking. The road network should clearly reflect the service and access requirements of the proposed buildings and facilities. Proposed facilities should provide sufficient right-of-way to accommodate roadway widening as long-term development occurs Major street intersections should be arranged at right angles and with adequate width and site distances. Offset intersections less than 125 feet apart should be avoided The number of access points to primary roadways should be minimized and on-street parking should be prohibited on primary and secondary roadways. Unneeded streets should be vacated to consolidate building sites. Access parking areas should be coordinated so that vehicular pedestrian conflicts are avoided Internal vehicular circulation should be coordinated to serve a group of buildings. Parking areas which are able to serve several adjacent facilities should be combined Parking areas should be screened and landscaped to reduce visual impact on adjacent areas and service areas should be located so that they are screened from roadways and adjacent uses.

(3) Utilities and drainage. In siting utility and drainage facilities, conflicts with existing major utility lines should be avoided in order to minimize development cost. All buildings and facilities should be located on well-drained sites and not in major drainage courses.

(4) Energy conservation. Prevailing winds, solar orientation and micro-climatic conditions should be considered in facility siting in order to allow for conservation of energy and user comfort and convenience.

b. Environmental/safety restrictions such as explosive quantity safety distances, noise contours, airfield and helipad safety zones, historical buildings or places, archeological sites, sensitive natural areas, unsuitable soils, and range surface danger zones should be considered when siting proposed buildings and facilities. When applicable, these environmental/safety restrictions will be shown on the Future Development Site Map. Even though these restrictions have been considered during development of the Land Use Plan, they should be reviewed to be sure that all constraints have been taken into consideration in siting individual buildings.

CHAPTER 7
PROJECT PHASING MAP

7-1. Objectives

The Project Phasing Map is a separate document prepared as part of the Installation Master Plan. It is prepared and submitted annually in accordance with the requirementsofAR21 0–20. The Project Phasing Map shows the short-range facility requirements (immediate five years) necessary to implement the Master Plain The basis objective of the Project Phasing Map is to outline a flexible short-term program of projects which are linked to and based on the long-term recommendations of the Master Plan Report. To support this short-term program, other objectives of the Project Phasing Map are to determine which of the wide range of potential long-range improvements have the highest priority for implementation; identify the level of allocated funds or other available funding resources to implement plan recommendations; and provide a means by which annual development programs can be evaluated for conformance with long- and short-term objectives.

7-2. Identification of projects

a. The first step in preparation of the Project Phasing Map is to identify those facility construction projects required for future development of the installation in accordance with the Master Plan. Projects based upon TERF report and the Future Development Plans should be listed. The list should include

Required buildings and facilities not now provided at the installation.

Improvements to existing buildings and facilities necessary to meet functional requirements.

Replacement of inadequate existing buildings and facilities.

Extension or replacement of existing utility service lines or facilities.

Widening, reconstruction, or extension of existing roadways.

- New roadway construction

Major maintenance and repair projects.

b. The scope of the projects will become the basic data for the evaluation and selection of priorities for projects to be included on the Project Phasing Map. Where a project can logically be programmed in two or more stages, project phasing should be considered in order to make the most effective use of available resources.

7-3. Evaluation and selection of projects

a The listed projects should be evaluated to determine their priority for construction within the next five years. The selected projects should be grouped in related sets which carry out specific development objectives of the Master Plan and effectively support the mission of the installation The relative ranking or priority of projects should be based on the extent to which the project carries out a specific objective identified in the Master Plan Report; would resolve a current problem or need; is necessary to carry out other projects; will contribute to long-term development of the installation in accordance with the objectives of the Master Plan; will contribute to completion of facilities or programs already underway; would be funded within authorized levels or can qualify for other finding sources; will improve the quality of the natural or man-made environment can be integrated with existing facilities to extend or improve their fictional capability; and has the capacity to support multiple facilities at the installation

b. The rationale for determination of priorities and selection of projects should be responsive to the particular needs and conditions which are expected to affect the installation for the following five-year period The general order of priorities which serve as the basis for determination of specific projects is as follows

Projects which resolve a critical functional deficiency.

Projects which resolve a current but non-critical functional deficiency.

Projects which are a necessary pre-conditioned for other projects to support future development

- Projects which support future long-range development
- Other projects.

APPENDIX A
CONTENTS OF MASTER PLAN REPORT

A-1. General

This appendix provides an outline for the recommended contents of the Master Plan Report The specific contents of each Master Plan Report should correspond to the items listed in this appendix but may be tailored to the individual requirements of the installation. The outline is to be used as a guideline in preparation of the Master Plan Report in conjunction with AR210-20 which sets forth the policies, procedures, and responsibilities for the Army Master Planning Program.

A-2. Exhibits

The Master Plan Report should include maps, diagrams, and charts when they will convey information necessary to present analyses or recommendations more clearly than text. The graphics prepared for the Master Plan Report should not duplicate maps or other materials already available. All graphics prepared for the Master Plan Report should be at a scale appropriate to the material presented. Those graphics showing on-post conditions or proposed development should be consistent in format and orientation to facilitate comparison of information. Exhibits which are required to be included in the Master Plan Report include the following

- Regional Setting.
- Vicinity Map.
- Community Land Use.
- Existing Land Use Pattern.
- Existing Road Network
- Buildable Areas.
- Concept Plan.
- Land Use Plan.
- Circulation Plan.
- Utility Service Plans, including as a minimum separate exhibits for the water system, sanitary sewer system, electrical distribution system, and gas system.

A-3. Report Outline

The Master Plan Report will be a comprehensive document. The report narrative will include the following elements

a. Executive Summary.
   (1) Authorization for and applicability of the Master Plan study.
   (2) Summary of missions.
   (3) Summary of major development potentials and limitations.
   (4) Highlights and interaction of contributing plans.
   (5) Summary of major planning recom-endations.

b. Table of contents/list of tables, charts, and illustrations.

c. Introduction
   (1) Purpose and scope of the report.
   (2) Summary of goals and planningobjectives.
   (3) Definition and planning assumptions.
   (4) History, mission, and organization.
   (5) Interface with higher HQs and other DOD agencies.

d. Data Collection and analysis
   (1) Off-post infrastructure and community interface.
      (a) Geographical location
      (b) Regional transportation system.
      (c) Socioeconomic conditions.
      (d) Community land use and planning
      (e) Community services.
      (f) Land leases and easements.
      (g) Federal support services.
   (2) On-post data analysis.
      (a) Natural environment.
         1. Geologic elements.
         2. Soil conditions.
         3. Topography.
         4. Hydrology.
         5. Vegetation and wildlife.
      (b) Human environment
         1. Historic/archeological setting.
         2. Current and forecasted demo-graphics.
         3. Military community services
         4. Outdoor ranges.
         5. Maneuver areas.

(c) Safety and health.
1. Air operations.
2. Explosives storage and handling.
3. Hazardous material
4. Electromagnetic safety.
5. Radiation safety.
6. Air quality.
7. Noise environment
8. Water quality.
(d) Land use/circulation/utilities relationships.
1. Land use.
2. Traffic circulation.
3. Utilities.
(3) Summary of limitations.
(a) Significant conditions.
(b) Buildable areas.
(4) Mission analysis.
(a) Mission definition.
(b) Organizational structure.
(c) Planning strength
(d) Functional relationships.

e. Concept plans.
(1) Needs and constraints.
(2) Existing spatial relationships.
(3) Synthesis.
(4) Goals and objectives.
(5) Alternate concept plans.
(6) The Concept Plan.
(a) Land use element
(b) Circulation element,
(c) Utility service element.

f. Long-range plans.
(1) Plan considerations
(2) Land Use Plain
(a) Administration
(b) Commercial services and community.
(c) Medical and dental.
(d) Training.
(e) Supply/storage and maintenance.
(f) Manufacturing and production facilities.
(g) Research, development and testing.
(h) Housing.
(i) Operations.
(j) Recreation.
(k) Water areas.
(1) Reserved land/buffer.
(3) Circulation Plan.
(a) Primary roadways.
(b) Secondary roadways.
(c) Parking.
(d) Service access and parking.
(e) Installation access points.
(f) Pedestrians.
(g) Rail service.
(h) Water transportation.
(4) Utility Service Plans.
(a) Sanitary sewer system.
(b) Water system.
(c) Electric power system.
(d) Solid waste.
(e) Storm drainage.
(f) Fuels, heating, and cooling,
(g) Communications system.

Environmental assessment and finding.

h. Appendix. Possible elements of the report appendix might include the following:
(1) Summary of Installation Visual Enhancement Study.
(2) Glossary of terms and abbreviations.
(3) Long, intermediate, and short-range construction programs.
(4) List of contributing plans and office or staff section responsible for each plan.
(5) Compendium of major Planning Board decisions (if required).

APPENDIX B
REFERENCES

Department-of Defense	
4165.45	Determination of Family Housing Requirements
4165.57	Air Installation Compatible Use Zones
Department of the Army	
AR 200-l	Environment Protection and Enhancement
AR 200-2	Environmental Effects of Army Actions
AR 210-ll	Installations Billeting Operations
AR 210-20	Master Planning for Army Installations
AR 385-10	Army Safety Program
AR 385-64	Ammunition and Explosives Safety Standards
TB ENG 353	The Overlay-Composite Method of Master-Plan Preparation
TM 5-801-1	Historic Preservation, Administrative Procedures
TM 5-801-2	Historic Preservation Maintenance Procedures
TM 5-803-4	Planning of Army Aviation Facilities
TM 5-803-6	Installations: Site Planning of Community Centers
TM 5-803-7	Civil Engineering prograrnming: Airfield and Heliport Planning Criteria
TM 5-822-2	General Provisions and Geometric Design for Roads, Streets, Walks and Open Storage Areas
TM 9-1300-206	Ammunition and Explosives Standards

The proponent agency of this publication is the Office of the Chief of Engineers, United States Army. Users are invited to send comments and suggested Improvements on DA Form 20289 (Recommended Changes to Publications and Blank Forms) direct to HDQA (DAEN-ECE-I), WASH, DC 20314-1000.

By order of the Secretary of the Army

JOHN A. WICKHAM, JR.
General, United States Army
Chief of Staff

Official:

R.L. DILWORTH
Brigadier General, United States Army
The Adjutant General

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