GEOGRAPHIC INFORMATION SYSTEM
FOR
CAPITAL DEVELOPMENT AUTHORITY
BY
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FINAL APPROVAL

This is to certify that we have read this project report submitted by AFTAB NAZIR AHMED and it is our judgement that this work is of sufficient standard to warrants its acceptance by Quaid-I-Azam University for the Post Graduate Diploma in Computer Sciences.

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THE NAME OF ALLAH
THE BENEFICENT
THE MERCIFUL

THE HOLY QURAN SAYS

OH! PROPHET (Peace Be Upon Him Say! If oceans are converted into ink to write the qualities of my creator then the whole Ocean would be consumed in writing before, His qualities come to an end and even if we produce the like of ink would also be insufficient.

[AL-KAHF]

HAZRAT MUAHAMMAD (Peace Be Upon Him) SAID

" VERIFY THE MAN OF KNOWLEDGE ARE INHERITEERS OF THE PROPHET."

ABSTRACT

The Geographical Information System has been developed for Capital Development Authority (CDA), Islamabad for Land Management Information System. This system has been built to maintain Land Information system, Computerization of Geographic Data and Attribute/Numeric Data. The System will provide error free and efficient services for planning, analysing and decision making purposes. Various kinds of queries and reports have been defined to further facilitate the consultants to easily retrieve geographic and numeric data for multiple objects. This system has been developed for Pentium computer by using following software:

i. Wide Image
ii. ArcView 3.1
iii. Micro Soft Access 2000

AFTAB NAZIR AHMED

ACKNOWLEGEMENT

All praise to ALLAH who is Unique, the Beneficient and the Merciful, I am really thankful to Almighty Allah who gives me knowledge and wisdom. I am thankful to my beloved PROPHET **HAZRAT MUHAMMAD** (Peace Be Upon Him) because in reality **HAZRAT MUHAMMAD** (Peace Be Upon Him) showed me right way by giving the unbreakable principles. These are th principles, which help me right way by giving the unbreakable principles. These are ht principles, which help me to determine the right way, I am greatly obliged to **Allah** for **His GRACE** that enables me to do this task.

Furthermore, a very special thanks to my loving parents and all family members for their encouragement. It is very true to say that my success is due to endless prayer. Their encouragement is source of determination for me.

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AFTAB NAZIR AHMED

DEDICATION

Dedicated to My Mother

who always pray for my success

Aftab Nazir Ahmed

PROJECT BRIEF

Project Title	**Study of Geographical Information System for the Application of Land Management Information System**
Organization	**Capital Development Authority, Islamabad**
Under Taken by	**Aftab Nazir Ahmed**
Supervised by	**Mr. Javed Hussain**
Software Used	**i. WideImage** **ii. ArcView version 3.1** **iii. Micro Soft Access 2000**
Environment	**Windows**
System Used	**IBM Pentueum Compatible**

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Submitted a dissertation to department of Computer Science Quaid-I-Azam University (QAU), Islamabad as a partial fulfilment of the requirement for the degree of Post Graduate Diploma (PGD) in computer science.

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PREFACE

This report is a description of design and development of computerized Geographic Information System for Capital Development Authority (CDA), Islamabad. Problems concerning the optimal use of land resources and improved land management are important all over the world. With increasing population pressures and a greater need for environmental controls. They must be given still greater attention. It is easy to find examples of the misuse of land resources, weak or non-existent planning, poor management and insufficient land regulation. The remedies are often difficult to develop and still more difficult to implement. The problem of how to develop good land information systems has, therefore, been debated extensively, especially since automations has greatly increased out ability to handle masses of data.

Information related to specified land units is a cornerstone of GIS, since data concerning ownership and other property rights, boundaries, areas, land uses, market and assessed values, building, habitation, etc,. are all interrelated.

The present study is devoted to the problem of developing efficient information systems based on such land units. It presents the historical background and the experiences gained from existing cadastres and land registers, discusses benefits and analyses methods, problems and alternatives especially in countries, where such systems currently are lacking or underdeveloped. It has been proven that they can from a natural basis for

comprehensive, multipurpose land information systems of great importance for improved planning, management and control.

This study does not attempt to develop entirely new modes, but rather is based mainly on study from different levels. I have, however, tried to use my own judgement to evaluate different methods. My ambition has been to provide an overview without delving too deeply into technical matters.

PREFACE

This report is a description of design and development of Geographic Information System (GIS) of Capital Development Authority, Islamabad. Work detail is as follows:

CHAPTER # 1

The Introduction to the Organization

CHAPTER # 2

Study of Existing System

CHAPTER # 3

Problems and Drawbacks in Existing System

CHAPTER # 4

System Requirement Analysis

CHAPTER # 5

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System Specification

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System Design

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CHAPTER # 1

INTRODUCTION TO THE ORGANIZATION

1.1 INTRODUCTION TO THE ORGANIZATION

Islamabad is Capital city of Pakistan,. It was established in 1964, since an authority was founded called Capital development Authority (CDA). CDA is an organization responsible for planning, development, maintenance and beautification of the city.

1.2 Organizational Structure

Like many development authorities CDA is an autonomous body. There is a chairman, who is head of the authority. There are four members work under the chairman. Each member heads separate wings e.g., planning wing, Member Land management, Member Administration, Member Finance, etc. Each member has a Director General, Deputy Director General, Director, Deputy Director, Assistant Director and other staff members.

1.3 Responsibilities

CDA is responsible for planning , development and maintenance of capital city. There is a master plan of the city, which has been approved by the Parliament and the Cabinet, and no change can be brought in the plan by the authority without prior approval from the parliament and then the Cabinet.

1.4 Urban and Rural Area

Islamabad Territory has been divided into two sections i.e., Urban and Rural area. Capital Development Authority is responsible to plan, development of the urban area, whereas Islamabad Capital Territory management department deals with rural development and management.

1.5 Planning and Land Management Wing

Planning wing of the authority works for planning of new sectors, roads, parks and for allocation of land for other requirements of the city. Moreover Land management wing takes over the affairs of land allocation, division and categorisation of plot construction and design affairs, and other related matters. This department endeavours to keep the city development by following the plan gives by the planning wing.

1.6 Municipal Management

There is a directorate of Municipality has to manage water, sanitation, road construction and maintenance, maintenance of parks and play grounds, etc. this department keeps all the records related to the directorate in manual or analogue form, which is difficult to handle, update, retrieve, etc. The existing system slowed down the working of the department, which is trouble some for the inhabitants of the city.

1.7 Financial Management

CDA has a finance department deals with financial matter of the authority e.g., collection of property tax, water and sanitation charges, collection fines in case of violation in plan or other wise, etc. This department has partially been computerised, moreover, there is small part of the whole directorate, which uses computerised data. It has also been found that mostly people, who have been deployed on computer are not perfectly trained, data has not been with geographic data, which can not be as useful as in other wise.

CHAPTER # 2

STUDY OF EXISTING SYSTEM

EXISTING SYSTEM

Presently the system exists in CDA is manual/Analogue. It is difficult to extract information about land use, e.g., who own it? Who occupies it? What is its status? What is the financial dealing with respect to the land? So to have the answers of these questions are very difficult.

The study reflects that number of departments or wings deals with different aspects, e.g., Planning wing deals with master plan of the capital and looks to restrict violation, Land management wing deals with land and related aspect, Municipal administrative wing deals with the matter related to municipality, etc. All the departments have their own analogue database. These offices use different maps for planning and implementation. Such as following are the points of existing system.

2.1 Map Data

Maps are considered instrumental for planning of any type of Land for example, development of towns, cities, roads, railways, etc. CDA like organizations use maps for planning, development, management, etc, purposes. There are various maps have been prepared for the said purpose by the different wings of the authority. These are paper maps and prepared by using traditional methods of surveying and mapping.

2.2 Multiple Maps Set

The amount of data a paper map can portray is limited by the map's size and scale. This usually means that a number of map set are required to meet all of authorities map requirements. These map sets have varying themes, scales, and levels of details.

2.3 Duplication of Information

Much information gets duplicated in these map sets. Base map information such as roads, drainages, and boundaries are usually repeated in each set. Thematic information is often repeated at varying scale to show various levels of detail. As a result, the same revisions must often be made to several map sets. Also, not all map sets are updated at the same time. One set may be current, whereas another contains out-of-date, and therefore conflicting, information.

2.4 Difficult Data Analysis and Presentation

Data users often ask the following questions about a location:

i. What is nearby?
ii. What is in this area?
iii. What else can you tell me about this?
iv. What areas have similar characteristics?

These questions usually require extensive research and analysis of maps and related data. With traditional paper maps and attribute or manual filing systems, this analysis involves comparing map sheets of differing scales and themes, as well as researching stacks of card files to correlate graphic and no graphic data. This is tedious and time-consuming process.

2.5 Attribute Data

There are many levels of the system, geographic data is captured and stored in shape of maps, whereas other related detail is stored by using the age-old method i.e., called filing system. The related information of maps are tagged in various files, this filing system starts from city master plan to plan of small house.

CHAPTER # 3

PROBLEMS AND DRAW-BACKS OF THE EXISTING SYSTEM

PROBLEMS AND DRAW-BACKS OF THE EXISTING SYSTEM

Following problems are faced by the exiting system.

i. Time consuming
ii. Easy to temper
iii. Costly
iv. Number of errors
v. Difficult to analyse
vi. Poor efficiency
vii. Difficult to access geographic and attribute data for analysis
viii. Chances of destruction
ix. Difficult to update
x. Administrative problems
xi. Not feasible to planners
xii. Not feasible to decision makers
xiii. Inaccurate and poor mapping
xiv. Huge space is required to store

3.1 Time Consuming

CDA like organizations are directly concerned by the people or inhabitant, businessmen, etc., people visit offices with junk of problems, which should be addressed and solved as early as can possible for minimizing their, time consumption, money and botheration. Thus the existing analogue or manual system is spread over different departments and sections, and access to any information or record is time-consuming process.

3.2 Easy to Temper It

Maps and other related material is kept in files, those are in the possession of clerks and other officials. Thus complains of tempering always surfaced besides lose administrative check consolidate apprehensions.

3.3 Costly

Lot of man power have been deployed to handle record, numerous staff have been engaged for surveying, mapping and printing process, huge area is required to store record, all such things enhance expenditures.

3.4 Number of Errors

It has also been found during the study that there are number of minor and major errors in spatial and attribute data, record can not be updated with regular interval, it is all because of manual data management process.

3.5 Difficult to Analyse

Paper maps and other data, which is scattered in different wings and sections of the authority is difficult to use for analysis.

3.6 Poor Efficiency

Existing system is poor and inefficient as it is evident from delays in decision-making, slow process of planning, development and ignorance.

3.7 Chances of Destruction

A common problem is the traditional map and files are lost, misplaced, destructed or misfiled. One cannot use a map or file that someone else borrowed.

3.8 Difficult to Update

Many maps and files systems are so poorly organized as to be nothing more than a place to get maps out the way. Lose adherence or responsibility for security, organization, and access to the data. These are few out of many causes of updating, as it is difficult process.

3.9 Administrative Problems

It is difficult to resolve administrative matter easily due to difficult to access record, months and years are required to extract required data. It is also difficult to give correct decisions in court cases due to the availability of poor information.

3.10 Not feasible to Planners and Decision Makers

Most organizations have departments that maintain their own independent filing systems. These files often use very different geographic reference systems. For instance, a municipal tax assessor uses reference real estate records to a parcel number, whereas the public utilities department references water and sewer customers to an account number. These references systems may worked well within each department, but it is very difficult to correlate the data among the various departments. Each system exists as an independent island of information. Which is not useful for decision makers and planners.

3.11 Inaccurate and Poor Mapping

Modern manual cartographic techniques are much improved over earlier processes. Copper plate engraving, ruling pens, and linen sheets have given way to scribing, drafting pens, and Mylar. Yet revisions to traditional maps still require erasing and reinking, or opaqueing and rescribing, the map original. But the CAD mapping technique are more accurate, distortion free, geo-referenced, quick and easy to edit at any time

3.12 Huge Space is Required to Store

Huge space is required for storing files, maps and other record, which is currently kept in conventional form, whereas very small space is required to store CD, Tapes, etc which contains data in digital form.

CHAPTER # 4

SYSTEM REQUIREMENT ANALYSIS

4.1 System Requirement

A system, which represents a major commitment of time, money, and organizational energy. Before getting into it, we need good reasons for investigating the use of a new system in CDA.

4.2 Need for GIS

There is a growing need all over the world for land information's as a basis for planning, development and control of land resources. Continuing expansion of production in the industrialized world exerts increasing pressure on scarce natural resources. Similar pressures on natural resources in the third word stem mainly from unabated population growth, Land, being in one way or another the basic source of most material wealth, is of crucial importance and will require effective management systems.

There is growing outcry for better land management and development controls by the public sector. But how can we plan and control without having sufficient knowledge and information about the basic element the land itself? General knowledge is not enough, what is required is detailed information about land use:

- Who owns the land?
- Who occupies it?
- What is the use of land?

A GIS is a tool for legal, administrative and economic decision making and an aid for planning and development which consists on the one hand of a database containing spatially referenced land related data for a defined area, and on the other hand, of procedures and techniques for the systematic collection, updating, processing and distribution of the data. The base of GIS is uniform spatial referencing system for the data in the system, which also facilitates the linking of data within the system with other land related data.

4.3 Justification for Land Documentation

The computer can quickly search and analyse these map features and their attributes in ways not possible with paper maps. For instance, suppose you are looking at the GIS display of a state highways map. Point at a particular road and click the computer's mouse button to find out that the roadway is state route 29, four lanes wide, paved with asphalt, and has a 45-mph speed limit. Click again to se the location of all traffic accidents that have occurred on that stretch of highway over a given period.

The capabilities that a well designed GIS should be able to provide as:

1. Quick and easy access to large volumes of data.
2. The ability to:

    a. Select detail by area or theme;
    b. Link or merge one data set with another;

c. Analyse spatial characteristics of data;
d. Search for particular characteristics or features in an area;
e. Update data quickly and cheaply; and
f. Model data and assess alternatives.

3. Output capabilities (maps, graphs, address lists and summary statistics) tailored to meet particular needs.

4.4 Application of Land Register for Development of Rural and Urban Areas

Development of rural and urban areas is often seen as two independent process. The problems are formulated in different ways: different specialists and organizations using different methods handle them.

4.4.1 Rural Areas

No one can question the magnitude of the problem to develop the countryside and give a secure tenure for those working on land. At present, the livelihood of more than half of mankind depends directly on agriculture. Nine/tenths of this total agricultural population is in developing countries, there question of access and rights to land are paramount interest to more than 2000 million people.

It has often been pointed out that one strategic way to promote development is to strengthen the building of institutional structures. Therefore in which ways can such an efficient system help?

1. Better information base for planning and administration.
2. Better specification of rights and more security.
3. Better possibilities to finance development.
4. Easier implementation of policy measures.
5. Better steering and control.

4.4.2 Urban Areas

Urban land is among the most valuable economic and social resources of any nation, and it cannot be properly managed without an adequate system for the measurement and recording of the boundaries of parcels, and the registration of all measurement and recording of the boundaries of parcels, and the registration of all legal rights related to each parcels e.g.:

i. Upgrading of squatter areas.
ii. Information and planning.
iii. Infrastructure and building.
iv. Public action implementation of different kinds.
v. Lists of land of landowners and of people living on the land or needed for many purposes.
vi. Census
vii. Elections

viii. Land and population Statistics

ix. Public administrations.

x. Better guidance and important preventing the urban explosion.

4.3 Justification for System Requirement

i. Secure and Organized Map Data

ii. Multiple map set problems eliminated

iii. Simplified map revision

iv. Simplified data analysis and presentation

v. Cost Effective

vi. Increased productivity

vii. Integrated map data

viii. Integrated Attribute Data

ix. Easy Accessibility

x. Easy Portability

xi. Easy to Store

CHAPTER 5

FEASIBILITY STUDY

5.1 System Feasibility

Any Organization, implicitly or, increasingly, explicitly, will have well defined objectives. The first element of planning must be the articulation of these objectives, which will underpin the organization's policy or strategy. In order to make nay progress at all, it is necessary t have an understanding of the organization itself, and how the organization functions within its environment, and we can characterize this component of planning as feasibility study. The aim of study will be to find out reasons and sources for designing and implementation of the system.

5.2 Financial Justification

Financial justification of system, presents a detailed model for the financial analysis of system, including implementation and maintenance costs, as well as cost savings. It relates published, empirical data on productivity improvements resulting from system.

5.3 Implementation Cost

There are three general types of costs associated with the implementation of system.

- Services
- Hardware and software purchases

- Database creation

5.4 Services

Services needed to implement a system will be included:

- Consulting
- Software Customisation
- Systems Integration

5.5 Hardware

Hardware includes

- Workstations
- Server
- Data storage devices
- Scanner
- Plotter
- Printers
- Data communication network

5.6 Software

Software cost includes:

- Operating System

- GIS application Programs
- Database Management System

5.7 Database Creation

Database creation will be the largest cost component of system and it includes:

- Surveying ground control
- Digital topographic mapping
- Conversion of existing paper maps and drawings
- Attribute data collection and entry

5.8 Costs

- Total cost of the system, including software, plotter, and other peripheral devices, equates to Rs. 15 million/-.
- The annual maintenance cost is 10 percent of the purchase cost.
- Ten new employees are trained on the system every year at a cost Rs. 120000/-

5.9 Cost Saving

The system cost savings is primarily found in four areas:

- Improved management decision making
- Reductions in facility construction costs

- Employee productivity improvement
- Employee cost avoidance

5.10 Base Map Accuracy

National map accuracy standards are the most widely accepted principles for map accuracy used in the country. Which can only be possible with the help of modern system of mapping and database management.

5.11 Legal Aspects of the System

Information ownership, control, management, and dissemination are a few of the issues these laws and regulations address. They aim to protect the rights of data owners to protect the rights of the public that pays for the data, to protect the privacy of individuals about whom information has been collected, to protect national and organizational security, and to rightly assign liability for damages arising from inaccurate or improperly used information.

Building a system, may cost hundred of thousands to millions of rupees, but the value of a system (GIS) exceeds the expense of building it.

5.12 The Role of Government

Federal Govt. agencies must collect and analyse data to carry out their various missions, much like any other organisation. Many of these missions involve land data, including the management and regulation of land, land use, real estate tax assessment, land title records, the environment, emergency response, public safety, public works, public utilities, and transportation systems. Some of these missions involve demographic data that can be related to geography, including age, income family, racial, and education statistics.

CHAPTER 6

PROPOSED SYSTEM

PROPOSED SYSTEM

1. Introduction
2. GIS Definition
3. Need for GIS
4. Justification for Land documentation
5. Application of Land Register for Development of Rural and Urban Areas
6. GIS analyses
    a. Network Analyses
    b. 3 Dimensional Analyses
    c. Spatial Analyses

6.1 Introduction

In recent years people have been taking more responsibility for running their own communities, from deciding about education and public safety to planning growth and development. But running a community is not easy.

Even within the smallest neighbourhoods people often have differing points of view. In cities, less and less money is available for public services. Having good information about the people, places, and things in the community is critical for making decisions that are practical and for working more efficiently.

Since geographic information systems came into common use in the early 1980s, more and more people have used computers to get detailed, up-to-date information about their community in the form of digital maps. But even more people who could be using GIS have yet to discover it. It's not for lack of books on the subject-a umber of books about GIS existed. Some explain how GIS works from a conceptual or technical perspective. Others address the management side of GIS. How to implement it in an organization? While many other books teach how to use GIS software. But few books have shown how real people actually use GIS. What GIS is and how it works by showing some of the many ways people are using GIS to solve everyday problems in their communities. In these tales from the digital map age, people talk about why, and how, they use GIS. We shall see GIS put to a variety of uses: quickly finding an address in an emergency, creating efficient delivery

routes, drawing new school boundaries, comparing the health of children from different neighbourhoods, tracking the change in crime throughout a city, and many other. For many years, GIS was a specialized field, composed of people whose sole job was to build geographic databases, perform analysed, and create maps. And while many still do specialize in GIS, many more use GIS as just one of the tools of their job, like a word processor or an electronic spreadsheet. Some use GIS software and data right out of the box, adding in their own data. Others customize the software with menus and buttons designed specifically for their data and their task. Still other combine GIS with information from other programs, such as spreadsheets or computer models.

What all this information presents is how GIS affects the daily lives of all us, how who use it as well as those who benefit from it. We may even start to think about how GIS can play a role in our community.

6.2 GIS Definition

Pickles considers that definition of GIS are likely to change quickly as technology and applications develop further. Some of the shorter definitions give an idea of what a GIS is, albeit in a superficial way. Rhind proposes that GIS is:

'A computer system that can hold and use data describing places on the Earth's Surface'.

Fuller definitions give more idea of what GIS can do, as well as what they are:

'A set of tools for collecting, storing, retrieving at will , transforming, and displaying spatial data from the real world for a particular set of purposes', or

' a system for capturing, storing, checking, integrating, manipulating, analysing and displaying data which are spatially referenced to the Earth'.

" A computer based system used to capture, store, edit, analyse, display and plot geographically referenced data."

In general, the definitions of GIS cover three main components, they reveal that GIS is a computer system. This implies more than just a series of computer boxes sitting on a desk, but includes hardware (digitiser, scanners, printer, plotters, etc) software, and appropriate procedures. They also tell us that GIS uses spatially referenced or geographical data, and that GIS carries out various management and analysis tasks on these data, including their input and output.

A GIS is a computer system that can store virtually any information found on a paper map. But it can be much more helpful than a traditional. A GIS can display maps on a computer screen, and it can provide detailed information about their features, including roads, building, rivers, and so forth.

6.3 Types of GIS Analyses

GIS can answer, and gives examples of each: attribute data queries, spatial queries, and set queries. It also looks at other specialized types of analysis, including buffers; feature merging, network analysis, digital terrain modelling, and grid cell modelling. In general, the three fundamental types of GIS analysis functions attribute data queries, spatial queries, and set queries can be performed on all types of spatial data:

a. Points
b. Lines
c. Areas
d. Nodes
e. Faces, and
f. Edges

6.4 Map Features

There Three main map features:

a. Area features
b. Linear features
c. Point features

6.4.1 Area Features

Delineated by closed boundaries. International, province, district boundaries and zones are examples of area features.

6.4.2 Linear Features

Sets of connected points that represent a feature that either has no width or that has width but are shown by a single line at the scale of the map being used:

i. Rivers
ii. Rail
iii. Roads
iv. Tracks
v. Utility lines, etc.

6.4.3 Point Features

Features that either represent the location of a feature that has no dimensions or a feature that has width and length but whose perimeter can not be mapped at the defined map scale.

i. Elevation control points
ii. Stream gagging stations
iii. Oil wells

iv. Springs
v. Mosques
vi. Temples
vii. Hospitals
viii. Schools, colleges and universities

6.5 Attribute Data Queries

A GIS database may store a map of tax parcel boundaries. Attached to each parcel will be a database record containing its attributes. These might include such things as the name of the owner, the street address, and the assessed value of the property. A GIS typically stores these spatial and attribute data in two different files, one containing the spatial data and the other containing attribute data in two different files. One containing the spatial data and the other containing attribute data. GIS software vendors typically provide interfaces to several database management systems that can store, manage, and analyse attribute data.

A GIS can also provide for much more sophisticated queries. Building a "Query statement," the user can define complex search parameters involving arithmetic and logical expressions. "operators" in the query statement (+,-,=,not=,>,<, <=, >=, etc.) specify the value to be found and can be combined in a single query. Thus, a GIS could answer the question "which tax parcels vacant zoned for commercial use, and larger than one acre, and where are they located on the parcel map?.

6.6 Spatial Queries

A GIS can also create a query set based on the spatial relationships of map features. Spatial operators in a query string define the spatial relationships that exist between map features. For instance, a city's emergency management agency might want to compile a database of all property addresses for addressing emergencies.

6.7 Network Analysis

Network analysis is useful for organizations that manage or use networked facilities, such as utility, transmission, and transportation systems. Utilities employ network models to model and analyse their distribution systems and meter reading routes. Municipal public works departments use networks to analyse bus and trash routes, whereas business use them to plan and optimise the delivery of goods and services.

Network tracing determines a particular path through the network. Network allocation assigns portions of the network to supply centres or destination points. If the supply centre were a school with the capacity to handle a given number of students,, the GIS could determine what portion of the community the school could serve. The system would allocate the school's capacity on a block by block basis, using census data on the school aged population.

6.8 Digital Terrain Modelling (DTM) and Analysis

A DTM is generally used to represent the surface of the earth, although other surfaces can be represented as well. There are two primary types of DTM data models:

i. The triangulated irregular network (TIN)
ii. Grid base data model

A DTM can be created from a series of data points that include the X-Y coordinate of each point, as well as its elevation (Z value). It can also be created from 3D topographic contour lines or 2D contours that have been tagged with their elevation value.

C H P T E R # 7

SYSTEM SPECIFICATION

Specification of the System

Designing of GIS system is like buying a refrigerator in that it is empty when delivered. Someone must stock it with data before the system will be useful. This required creating a digital base map to which all other GIS data themes can be registered. Following steps are considerably important for the successful implementation of the newly designed system.

i. Management support
ii. Training
    a. Hardware
    b. Software
    c. Data conversion and maintenance
    d. Data communication
    e. Software customisation
iii. User support

7.1 Management Support

Establishing and maintaining a GIS requires a significant expenditure of time and money. Therefore, it most often needs approval by the top decision makers of CDA. Although this is true of many other capital improvement programs, a GIS is different in that the top-level decision makers are usually not familiar with GIS technology. Some understand the basic of computer technology, but few are familiar with

mapping concepts in general and computer mapping in particular. A GIS program also needs a clear vision of objectives. This vision may serve as the foundation of the system's implementation plan.

7.2 Training

The new GIS requires training for employees who will use the system. Various levels of training are required, depending on the type of user the employee happens to be.

7.2.1 Hardware

Hardware training includes the following:

i. Computer related hardware handling
ii. Use of scanner
iii. User of printer
iv. Use of plotter
v. Use of
vi. Use of backup storage devices

7.2.2 Software

a. Training in Windows NT operating environment
b. Training in scanning software
c. Training in software used for spatial data capturing (AutoCAD map 2000, ArcView)

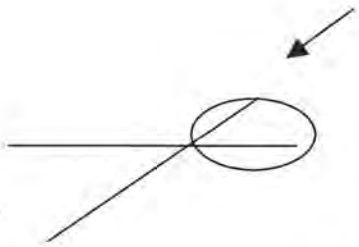
d. Training of Microsoft Access

7.3 Data conversion and Maintenance

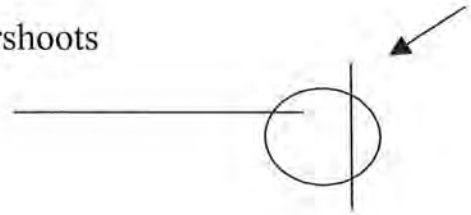
The most difficult process of a GIS program is converting existing land and facility records to a digital format. Therefore the training in software is not enough rather training in mapping technique is also crucial for this purpose. Consequently such training will encompass the following feature:

i. Geographic data capturing
ii. Edge matching
iii. Common features
iv. Networks
v. Polygons
vi. Lines and its classifications
vii. Connectivity

Over shoots



Undershoots



Gaps

Not closed line

i. Loops
ii. Data format
iii. Data Base Management System
iv. Relational Database
v. Queries
vi. Linking geographic data with attribute data

7.4 Data Communication

There are numerous departments that need access to the database. Distributing the GIS data is the key to making this data available to them. A data communications network is the most commonly used vehicle for GIS distribution. Training in network communication is very much essential.

7.5 Funding

A complete GIS program for a municipality, utility can cost hundreds of thousands Rupees to implement, and tens to hundred thousands to maintain each year. Obviously adequate funding for the program is vitally important. A phased implementation program may be presented to the utility commission, which approved it.

CHPTER # 8

SYSTEM DESIGN

SYSTEM DESIGN

Data processing technology has been developing rapidly or the last thirty years. Because GIS relies on computer systems, it is obvious that changes in the broader field of information systems technology will have an effect on GIS. GIS also relies on a database of graphic information. Therefore, GIS users seek methods of collecting spatial data that will reduce the cost of constructing this database. Fortunately, new technology is also providing less costly means of capturing GIS data. Because technology is changing so quickly, there is risk that much discussion of GIS technology trends will seem ridiculously out of date by the time if it is implemented by CDA. Therefore, here is limited to well-defined, general trends observed over the years. There are several peripheral systems that affect GIS, including video displays, data storage, multimedia, scanning, and plotting. These technologies have also been developing quite rapidly.

8.1 Data Networks and Data Communication

The trend of the 1990s clearly has been toward distributed, heterogeneous computing. Computer users have been demanding the ability to network all of their existing systems. They have also rejected the one vendor approached. Vendors have responded by down playing their proprietary solutions and embracing industry standards, a concept often referred to as open systems. This gives users the flexibility to select the best combination of solutions for their applications. Individual

procedures within an application can be processed on computers and devices best suited for the task.

LANs is built upon a backbone, a single cable that interconnects all devices on the network and transmits the data among them at very high transmission rates. Several types of network cabling can be used, including coaxial, twisted pair, and fibbers optic. A protocol for data transmission is also required. Several networking protocols are commonly used today, including TCP/IP. The network protocol allows all devices on the LAN to communicate and exchange data using a common data format. This makes it possible to set up a common database of information, as well as to share application software. Sharing a common database is very important in many multi-user GIS environment, such as municipalities and utilities. Many GIS vendors offer network licenses that permit a designated number of user workstations (clients) to have access to the application software residing on a file server.

An obvious advantage of distributed computing is that each user has access to his own computer, whether it is a PC or a workstation. This is particularly important in GIS, where the size of the graphic files to be manipulated and analysed can be in the range of several megabytes each.

Numerous other devices can also be installed on LAN, including printer, plotters, and scanners. Because the LAN makes it possible for all users to have access to any of these devices, it is far less expensive to provide them.

Another significant advantage lies in the fact that individual departments responsible for processing and updating a particular data layer or theme can restrict control of that data to their LAN serve. Other departments can still have access to the data, but can be prevented from editing or adding to that data layer.

8.2 Computer

GIS users have unique computer requirements the typical office computer user does not have. They work with large amounts of data and need to see intricate drawing's plans, and maps on the computer screen. They perform several operations that require a lot of computer power all at one, such as running an analysis while plotting a map, GIS projects can involve dozens of files totalling hundreds of megabytes of data storage. Many organizations find that the typical PC does not offer the processing power (computational and input/output speed) to satisfactorily handle their GIS applications, especially if their spatial database is large. As the GIS database grows in size, the response time of the PC slows down significantly.

A third type of desktop computer has appeared recently: the personal workstation. The personal workstation is a single computer that supports both processing-intensive technical applications as well as office applications. Based on the windows NT operating system, the same word processor's and the same spreadsheet programs right out the box. The personal workstation includes a number of standard features for the

technical user that the typical PC will not have, including a 32bit operating system and data path, on-board network interface cards, faster data buses, and large-screen (19" or more), high resolution graphic cards, high-resolution monitors and max. high speed processors (2.4 GHz) and extensive RAM (512 MB).

8.3 Operating System

Windows NT is targeted toward the data server and personal workstation market and takes advantage of the advanced features of the Pentium and the Pentium Pro Microprocessor. Windows NT is the first Microsoft operating system to natively support 32 bit applications, combining the power of UNIX with the user friendliness of windows. Its five users access to the wealth of personal productivity tools already developed for windows. Built-in networking capabilities provide access to information maintained on workstations, PCs, servers, and mainframes.

8.4 Application Software

An important trend in computing systems architecture is the development of common graphical user interface (GUI), or window, to all applications software. Related to the development of the GUI is the use of standard application programmer interfaces. GIS vendors recognized that their customers would want to tailor a core GIS product to suit their particular needs. They offered macro development languages

for this purpose, but each GIS vendor had it own such API. Today, GIS products may be customized using standard APIs such as the Visual Basic, Visual C, etc. Most advanced GIS software package make use of a relational database management system (RDBMS) to store and manage graphic (attribute) data. A number of powerful RDBMS are supported by GIS packages today, including Dbase-III/IV Informix, ingress, oracle, and Sybase. Many of these GIS packages offer a single interface to several RDBMSs.

GIS software and database vendors have collaborated to make it possible to store spatial data in RDBMS. This development makes data management easier and enables better integration between GIS and other types of data, including personnel, financial and logistical information.

The following software are recommended for Spatial data capturing and analysis:

i. ArcView
ii. MapInfo
iii. WideImage
iv. Access/FoxPro/Oracle

8.5 Database Development

In GIS, there are two types of data to be managed:

i. Spatial data

ii. Attribute data

CDA will use scanned existing maps, photographs, and other hard-copy products and leaving them in the GIS database as a raster image create the hybrid database. This raster file can be displayed along with vector GIS data, or new vector data can be digitised on top of the raster data. The advantage is that his is less costly than vector digitising all of the features from the existing maps or photographs. The chief disadvantage is the tremendous data storage requirements of the raster files. The raster data used in GIS is often prepared from Arial photography and satellite imagery. Both sources of raster data are benefiting from technology advancements.

Satellite imagery can also be used as a raster backdrop to vector GIS data. The principal types of satellite imagery used in GIS have been Multispectral images from the SPOT and Landsat programs (Multispectral means the images covered multiple bands in the electromagnetic spectrum, from the visible through the infrared.). These images had a resolution of 20 and 10 meters, respectively. The availability of high-resolution, one-meter satellite imagery will cause many more people to use such imagery for GIS Applications.

8.6 GIS Data Format and Standards

In general, the two most widely used types of GIS data structure are:

i. Raster format

ii. Vector format

Both the raster and vector models for storing geographic data have unique advantages and disadvantages, and a full-function GIS will handle both types.

8.6.1 Raster Data

Raster data files consist of rows of uniform cells coded according to data values. An example would be land cover classification. The computer can manipulate raster data files quickly, but they are generally less detailed than vector data. Raster data files cannot be used for analysis (GIS) whereas vector data file is used for these purposes. Maps available with the CDA will be scanned, and as Raster data will be used.

8.6.2 Vector Data

Vector digital map data is recorded as distinct points, lines, or areas. In vector model, informational about points, lines and polygons is encoded and stored as a collection x-y coordinates. The location of a point feature, such as a manhole, is described by a single x-y coordinate linear feature, such as roads and rivers, streams are store as a string of point coordinates. Polygonal features, such as sales territories and lakes, are stored as a closed loop of coordinates. The vector model is useful for describing discrete features, such as building, but less useful for describing continuously varying features, such as soil types or vegetative

land cover. The vector format provides for a more accurate description of the location of map features.

8.6.3 Data Input

The most important question is, will this system meet our needs in these four areas:

i. Input
ii. Manipulation
iii. Analysis and
iv. Presentation

Functions that will be needed are outlined in the following lists.

8.7 Data Input

Requirements will be included:

- Manual digitising
- Scanning
- Keyed bulk data entry
- Automatic checking and corrections for digitising errors
- Acceptance of existing raster and vector data

The following spatial detail will be taken/victories from the available analogue maps available with CDA. It is noted that these

features can be varied as polygon to point and point to polygon by following scale factor.

i. Area/polygon features are included
    a. Map Projection
    b. Blocks
    c. Residential parcels/plots
    d. Commercial parcels/plots
    e. Industrial plots
    f. School
    g. Parks
    h. Play grounds
    i. Hospitals
    j. Grave yard

ii. Line features are included
    a. Roads Centre line
    b. Contours/Elevation
    c. Tracks
    d. Power line

iii. Point features are included
    a. Schools/colleges/universities
    b. Mosques
    c. Hospitals
    d. Commercial sites

8.7.1 Data Manipulation

Requirements will include:

- Data revisions
- Thinning and Weeding digital line work
- Sliver polygon removal
- Transformation between map projections
- Edge matching of adjoining map files
- Transformation of data to fit specified control points
- Merging data from a variety of digital and hard copy sources into a common digital database
- Raster to vector conversion
- Merging polygons with common attributes
- Computing distance buffers
- Aggregating data within specified parameters

8.7.2 Data Analysis

Functions will be included:

- Point, Line, and polygon overlay analysis
- Geometric measurements and calculations
- Analysis of proximity and contiguity
- Spatial data queries
- Attribute data queries
- Coordinate geometry calculations

- Digital terrain modelling an analysis
- Network analysis

8.7.3 **Data Presentation** requirements will be included:

- Display and plot of raster and vector data
- Display and plot of data at user-defined scales
- Display and plot of digital terrain models
- Automatic plot of attribute data as map test
- Automatic generation map symbols based on attribute data
- Specific printer and plotter capabilities
- Specific report and map output formats

8.8 Vendor Support

In GIS usually required significant after sale support from the vendor, the next consideration is what support will this vendor provide? This key question pertains to hardware and software support, as well as to future developments. Therefore following facts will be considered during procurement of hardware and software for the authority.

8.8.1 **Hardware Support** includes:

- Location of field service technicians
- Size of the field service staff

- Size of the available parts inventory
- Schedule of maintenance services
- The cost of basic and extra services.

8.8.2 Software Support includes:

GIS Software are not commonly used or available therefore it demands extra focus on specification and purchasing. It will be procured from company/s those will offer the following services:

- Procedures for logging and resolving problems will be faced by the authority during application
- Size of the supporting staff
- Vendor policy for responding on authority requests for changes
- The cost of software
- Support for future innovations or inventions

8.9 Attribute Data

Spatial data are the 'where things are' data and attribute data the 'what things are'. For example, a latitude and longitude reference gives the location of a point entity and to accompany this there would be attribute data about the nature of the real-world feature the point represents. The data in a computer database are managed and accessed

through a database management system. Individual application programs will access the data in the database through the DBMS.

The following attributes will be instrumental for initial introduction of the system (as many more attributes can be linked with spatial data for more analysis as the requirements can be):

8.10 The System Contains Thirteen (13) Tables

8.10.1 Sector

Sl. #	Field Name	Description	Data Type
1	Sector_No.	Name of Sector/No.	Text/String
2	Sub_Sector	Sub sector	Text
3	Plot_No	Plot/Parcel No	Text
4	Street	Street No.	Text
5	Type	Plot type	Text
6	Size	Plot size	Number

8.10.2 Owner

Sl. #	Field Name	Description	Data Type
1	Plot_No.	Plot No.	Text
2	OwnerName	Owner Name	Text
3	Sex	Sex	Text
4	F_Name	Father Name	Text
5	ID_No	Identity Card #	Text
6	PrentAddress	Present Address	Text
7	PerAddress	Permanent Address	Text
8	Profession	Profession	Text
9	ResPhone	Residence Phone No.	Number
10	OffPhone	Office Phone No.	Number

8.10.3 Land use

Sl. #	Field Name	Description	Data Type
1	Plot_No	Plot No.	Text
2	OrigLandUse	Original Land Use	Text
3	PresLandUSe	Present Land Use	Text
4	OrigLandArea	Original Land Area	Number
5	OrigDate	Date	Date
6	AddLandArea	Additional Allotted Area	Number
7	AddDate	Date	Date

8.10.4 Land Cost

Sl. #	Field Name	Description	Data Type
1	Plote_No	Plot No.	Text
2	OrigCost	Original Cost of the Plot	Number
3	AddPremCost	Additional Premium Cost	Number
4	InstalAllow	Instalment of the Cost Allowed	Number
5	AdvPayStat	Advance Payment Demanded	Character
6	AdvPayment	Amount of Advance Payment	Number
7	Date	Date	Date

8.10.5 Land Payment

Sl. #	Field Name	Description	Data Type
1	Plot_No	Plot No.	Text
1	AdvPayment	Advance payment	Number
2	AdvDate	Date	Date
3	Instalments	Number of instalment	Number
4	Inst_I	Instalment # 1	Number
5	DueDate_I	Due date of payment	Date
6	PayDate_I	Date of payment	Date
7	Delayed_I	Payment Delayed	Character
8	DelPay_I	Delay payment charges	Number
9	Inst_II	Instalment No 2	Number
10	DueDate_II	Due date of payment	Date
11	PayDate_II	Date of payment	Date
12	Delayed_II	Payment Delayed	Character
13	DelPay_II	Delay payment charges	Number
14	Inst_III	Isntalment # 3	Number
15	DueDate_III	Due date of payment	Date
16	PayDate_III	Date of payment	Date
17	Delayed_III	Payment Delayed	Character
18	DelPay_III	Delay payment charges	Number

8.10.6 Plot Status

Sl. #	Field Name	Description	Data Type
1	Plote_No	Plot No.	Text
2	Quota	Quota of Govt. Servant/Private	Text
3	AllotMode	Mode of Allotment	Text
4	Date	Date	Date
5	CurPlotStat	Current Plot Status	Text
6	AppNo.	Application No.	Text
7	AllotNo.	Allotment No.	Text
8	BidRate	Rate of Bid	Number
9	PossDate	Possession Date	Date
10	TranStatus	Transferable or not	Text

8.10.7 Plot Division

Sl. #	Field Name	Description	Data Type
1	Plote_No	Plot No.	Text
2	SubDiv	Subdivision of plot	Number
3	Area	Area	Number
4	SubDivArea	Area of Subdivision	Number
5	DivDate	Date of sub Division	Date
6	Owners	Number of owners	Number

8.10.8 Construction

Sl. #	Field Name	Description	Data Type
1	Plote_No	Plot No.	Text
2	Plan_Sub_Date	Plan submission date	Date
3	Plan_Appr_No.	Plan approval No.	Text
4	Date	Date	Date
5	CompStat	Completion status	Text
6	Date	Date	Date
7	Cons_Violation	Violation	Text
8	Detail	Detail of violation	Text

8.10.9 Property Tax

Sl. #	Field Name	Description	Data Type
1	Plote_No	Plot No.	Text
2	PropTax	Property tax	Number
3	IssueDate	Issue date	Date
4	Period	Period of tax	Text
5	PayDate	Date of payment	Date
6	Delay	Delay payment	Text
7	Charges	Delay payment charges	Number
8	Amount	Total amount paid	Number
9	ReceiptNo	Challan or receipt No.	Text

8.10.10 Water Charges

Sl. #	Field Name	Description	Data Type
1	Plote_No	Plot No.	Text
2	Water_Charge	Water charges	Number
3	Issue_Date	Date	Date
4	Period	Period of billing	Text
5	DueDate	Due date of Bill	Date
6	PayDate	Date of payment	Date
7	DelayCharge	Delay	Text
8	Amount	Total amount paid	Number
9	ReceiptNo	Receipt No.	Text

8.10.11 Transfer of Plot

Sl. #	Field Name	Description	Data Type
1	Plote_No	Plot No.	Text
2	NumTran	Number of time transferred	Number
3	Name	Transferee Name	Text
4	NIC	Nation ID No.	Text
5	F_name	Father's Name	Text
6	Date	Date	Date
7	Address	Address	Text
8	Profession	Profession	Text
9	ResPhone	Residence Phone	Text
10	OffPhone	Office Phone	Text
11	TransNo.	Letter No.	Text

8.10.12 Financial status of Transfer

Sl. #	Field Name	Description	Data Type
1	Plote_No	Plot No.	Text
2	Trans_Type	Type of transfer	Text
3	TransFee	Transfer fee	Number
4	Paid	Paid or not Paid	Text
5	ReceiptNo	Bank or Receipt No.	Text

8.10.13 Table No. 14

i. Roads/Street names

CHAPTER 9

SYSTEM IMPLEMENTATION

APPLICATION OF THE SYSTEM (GIS)

The best way to understand exactly how to use GIS is to describe a typical GIS application. We shall look at how a GIS might be used in a typical municipal government. There are few out of many uses of GIS:

i. Planning and land use
ii. Engineering and public works
iii. Tax mapping
iv. Voter and school districting
v. Dispatch management
vi. Survey crew
vii. Public utilities department

9.1 Planning and Land Use

Special planning studies that used to require several days now can be done in a few hours. For instance, the town manage frequently asks the town planner to do research, such as find all parcels larger than five acres that are zoned for industrial use. He might also be asked by a member of the town council how much undeveloped land is planned for residential development. He now uses the GIS terminal located in the planning department to answer these questions He completes his research in fraction of the time it took him to do so in the past. The town planner can also produce a variety of custom maps and reports with relatively little effort. Moreover, plotting the maps in colour using the town's

colour electrostatic plotter makes very attractive presentation materials for public hearing.

9.2 Engineering and Public Works

The director of public works is responsible for the town survey crew, the drafting operation, building inspection and permitting, maintenance and operation of the town water sever systems, and operation of the town water and sewer systems, and engineering design. He is also responsible for the maintenance of all public works graphic data in the GIS database, as well as no graphic engineering.

9.3 Tax Mapping

The tax assessor's office is responsible for assessment and collection of taxes on its parcels (Plots). In the past, the tax assessor maintained two principal types of tax records: a set of tax maps and a set of real estate files. The tax assessor now has a full-time data entry clerk who updates these real estate files daily. These updates are made necessary by new subdivision recording, property transactions, and the annual reassessment.

After the tax maps were loaded into the GIS, the software was able to link the graphic files describing parcel boundaries with the real estate files contain tax parcel data. The parcel identification number made this

linkage possible, even though these two sets of files were, and continue to be maintained on separate computer.

9.4 Voter and School Districting

Both the town's school board and voter registrar make good use of the GIS. The Scholl directorate facility engineer uses his GIS terminal to retrieve engineering data. He works with the transportation manager to plan school bus routes. The school board also uses the GIS when planning new schools or considering the consolidation of schools. They can use the GIS to quickly determine the distribution of school age children throughout the city or to report the number of students that lie within a given distance of a potential school site.

The registrar uses the GIS in two ways. When new citizens come in to register to vote, she can quickly determine what voting district they reside. She simply types in their address at the GIS terminal the system searches for the address in its database and then compares this location with the overly of voting precincts.

9.5 Dispatch Management

The police and fire departments also use the GIS for incident analysis. The GIS can read a file of police or fire incident locations, then locate and display them on the town street maps. This can prove a great aid in the analysis of trends in criminal activities.

9.6 Public Utilities Department

Public utilities department can use the GIS to manage the town's water and sever systems. Today, the department used two sets of maps: one shoed the location of water mains and fire hydrants, the other showed the locations of sanitary sewer mains and manholes. Similarly they can find information about a section of pipe, including its size, material, slope, capacity and date of installation. Moreover, they can ask the GIS to search for information such as the location of all the storm sewer lines larger than 24" in diameter. They might also ask the GIS to find all the water valves installed.

9.7 IMPLEMENTATION OF SYSTEM (GIS)

A common problem with traditional map files is lost, misplaced, or misfiled sheets. In many cases, there is also a problem with not being able to use a map that someone else has borrowed. Also, many map filing systems are so poorly organized as to be nothing more than a place to get

The computer stores the grid coordinates of these features to show where they are, and the attributes of these map features to show what they are. Second, map features can be displayed or plotted in any combination and at virtually any map scale, making computerized mapping data far more flexible to use than traditional paper maps. A GIS can analyse spatial (locational) relational ship among map features. A GIS can determine

how many acres of land zoned for commercial use are located within a town's flood plain.

A GIS includes geological, environmental, biological, and developmental factors, as well as fishing, forestry, and farming practices, such as the use of pesticides. Moreover, changes in these factors can be monitored over time, providing a tool for measuring the impact of policy decisions.

It is important in deciding where you want to spend your conservation and restoration resources.

Business has also turned to GIS to help develop market strategies, determine the best locations for new retail stores, fine tune product delivery routes, dispatch taxis and service trucks, and analyse sales territories.

Municipalities and utilities throughout the WORLD have generally embraced the concept of GIS, hampered only by the tremendous cost of converting mountains of paper map data to a computer format. The country/city planning and assessment departments first implemented GIS to manage its property record, including tax parcel, zoning, and land use maps.

GIS database is used by numerous other departments and agencies, including the fire services, inspections, and Emergency management departments, as well as the school system, the elections commission, and

the soil and water conservation service. Several cities and towns within the country can be managed including water and sewer lines, roadways, utility networks, and administrative districts.

CHAPTER 10

USER GUIDE

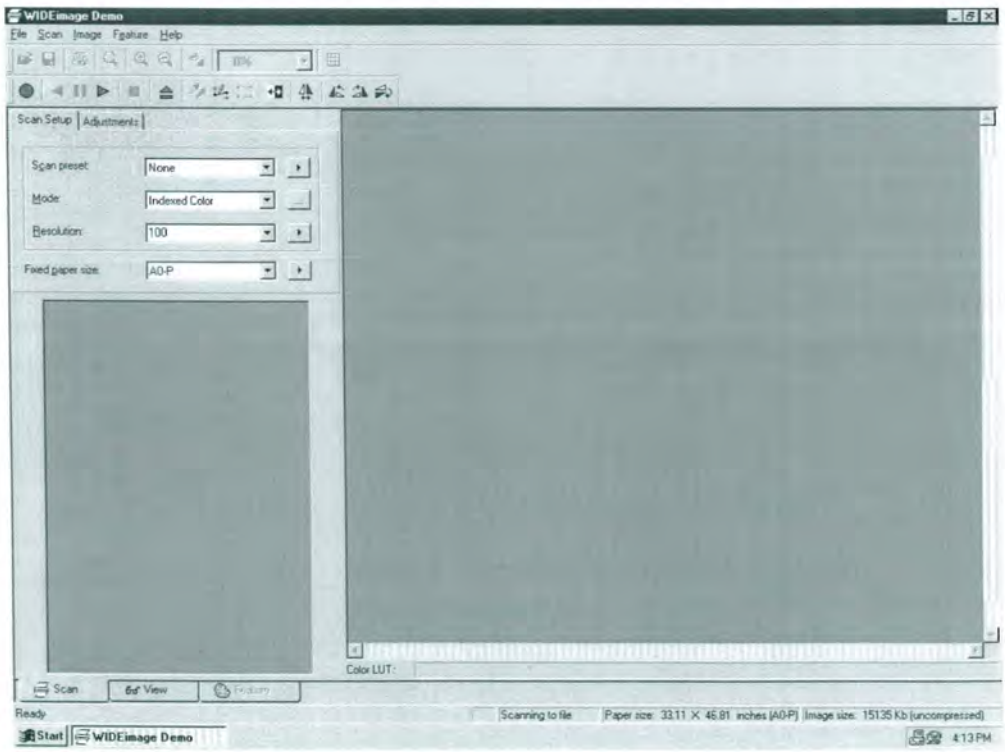
User Guide

There are many application software have been introduced in previous chapter for GIS development. Those are options, now there are three software those will be initially used in system development.

a. Wide Image
b. ArcView
    i. Image analyst
    ii. 3D Analyst
c. Access

10.0 Wide Image

This software will be used for scanning of maps or images. It assists to set resolution of image, image rotation, change in scale, colour setting, etc.



ARCVIEW'S USER GUIDE

10.1 Introduction

Environmental Systems Research Institute (ESRI), makes ArcView the makers of ARC/INFO, the leading geographic information system (GIS) software. We have been helping people solve spatial problems with computers for over 20 years.

You don't need to know how to create geographic data in order to use ArcView. ArcView comes with a useful set of ready-to-use data. Additional geographic data sets are available from ESRI and from various third parties to suit almost any requirement you might have. Plus, if your organization uses ARC/INFO data, you'll immediately be able to use ArcView to access all these resources, including vector coverage, map libraries, grids, images and event data.

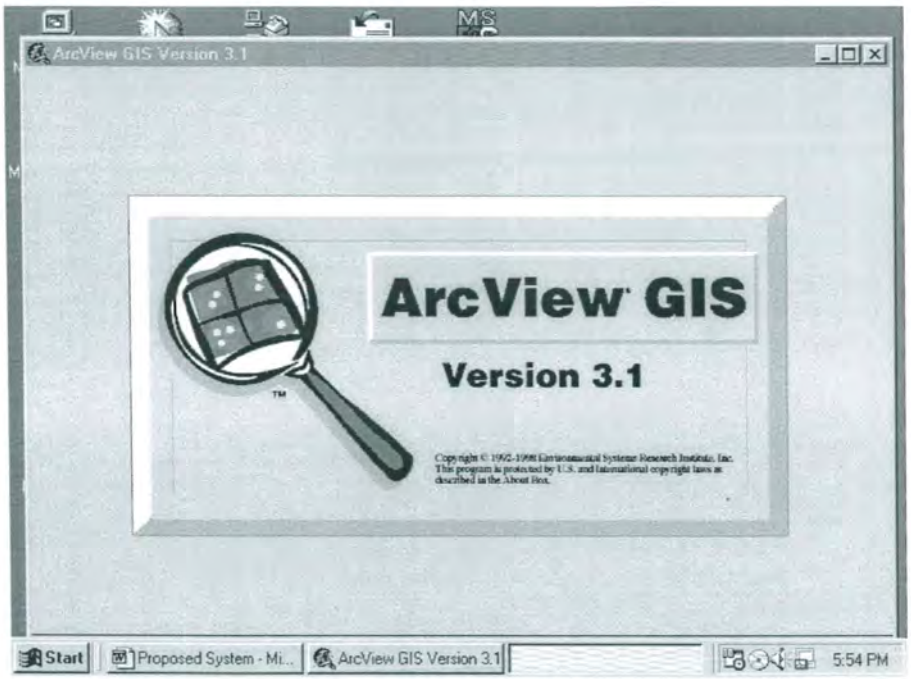
10.2 Working Spatially

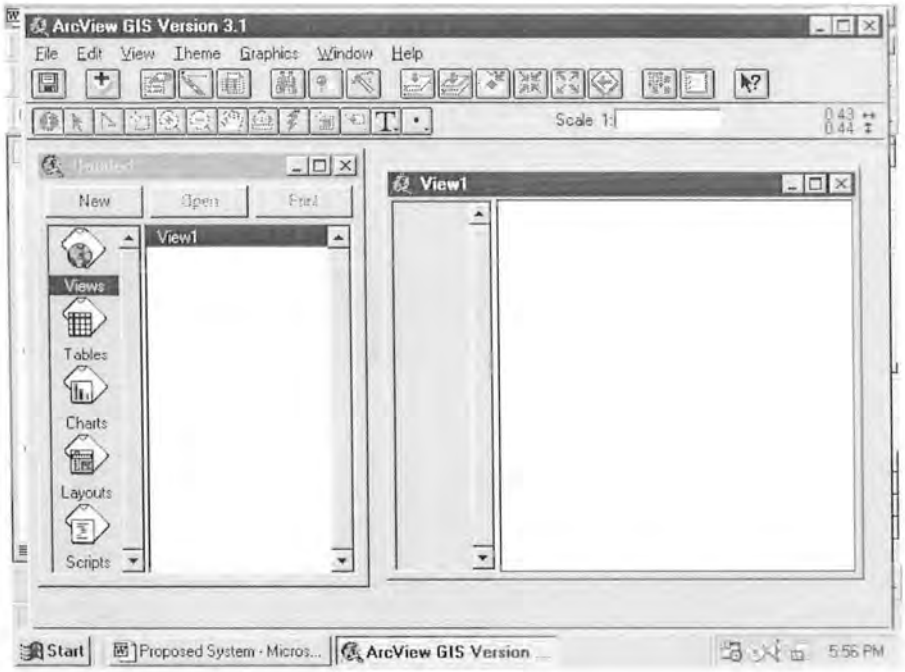
ArcView can be used by anyone who wants to work spatially. A key feature of ArcView is that it's easy to load tabular data, such as dBase files and data from database servers, into ArcView so that you can display, query, summarize, and organize this data geographically.

In no time you'll be working with your data in a completely new way, seeing patterns you couldn't see before, understanding geographic relationships that were previously hidden, gaining new insights...and achieving new results for you and your business.

10.3 Views

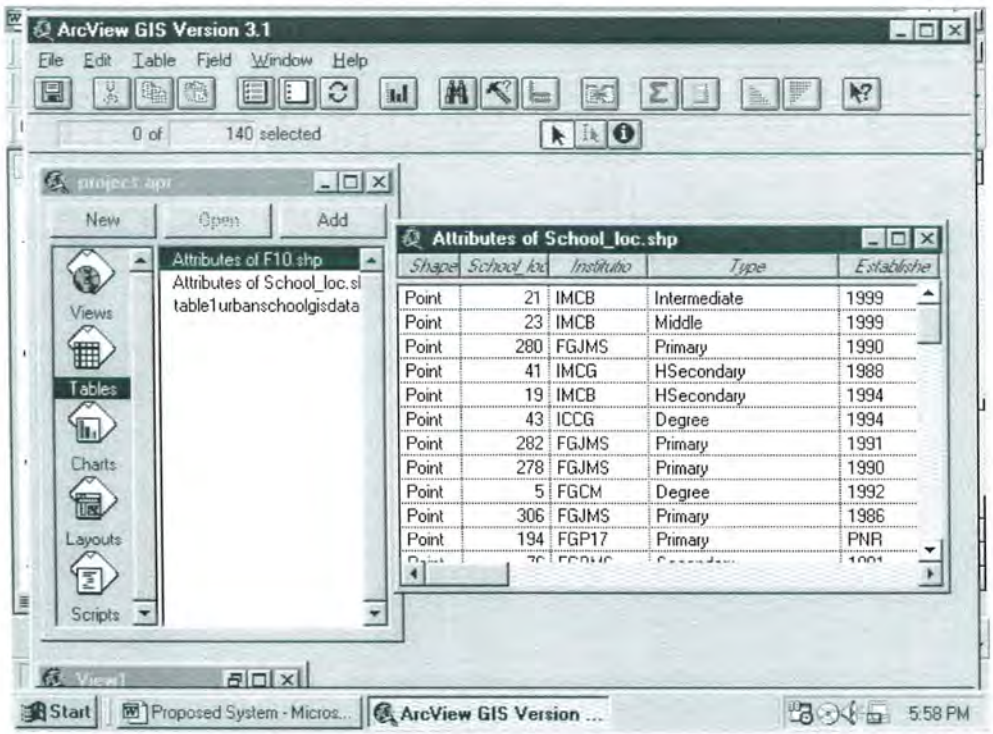
With ArcView you work with geographic data in interactive maps called views. Every view features ArcView's unique geographic 'Table of Contents', making it easy to understand and control what's displayed. GIS has never been simpler!





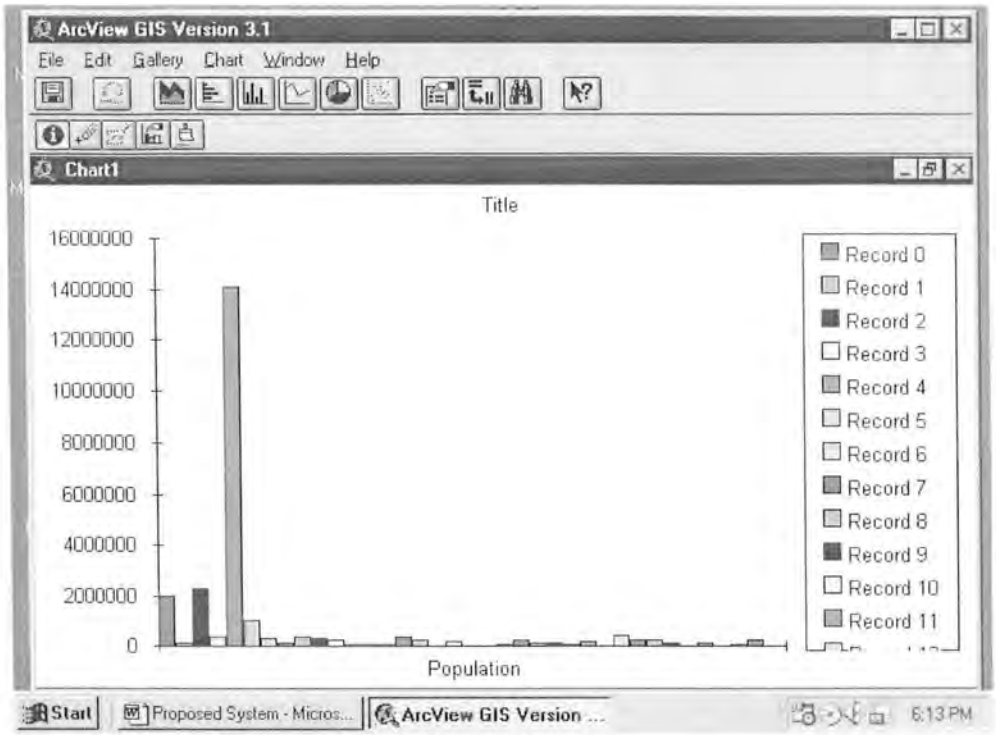
10.4 Tables

Working with tabular data in ArcView's tables puts you in control. Click on features on a view, and their records highlight in the table showing you their attributes. Select records in the table and the features they represent highlight on the view. ArcView's tables also have a full range of features for obtaining summary statistics, sorting and querying.



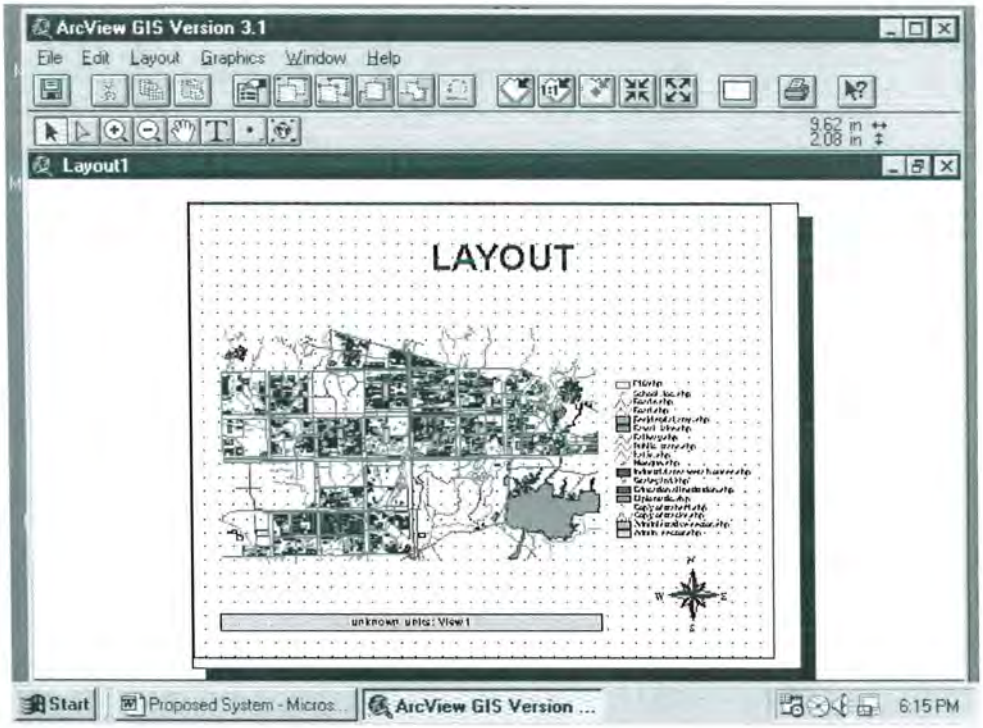
10.5 Charts

ArcView's charts offer a powerful business graphics and data visualization capability that is fully integrated into ArcView's geographic environment. You can simply click on features on a view to add them to the chart. ArcView lets you work simultaneously with geographic, tabular and chart representations of your data.



10.6 Layouts

ArcView's layouts let you create high quality, full colour maps by first arranging the various graphic elements on-screen the way you want them. You'll get great looking results on a wide range of printers and plotters. Layouts are smart because they have a live link to the data they represent. When you print a layout, any changes to the data are automatically included, so you know everything on your map will be up-to-date.



10.7 Scripts

ArcView scripts are macros written in Avenue, ArcView's programming language and development environment. With Avenue you can customize almost every aspect of ArcView, from adding a new button to run a script you write, to creating an entire custom application that you can distribute.

10.8 Projects

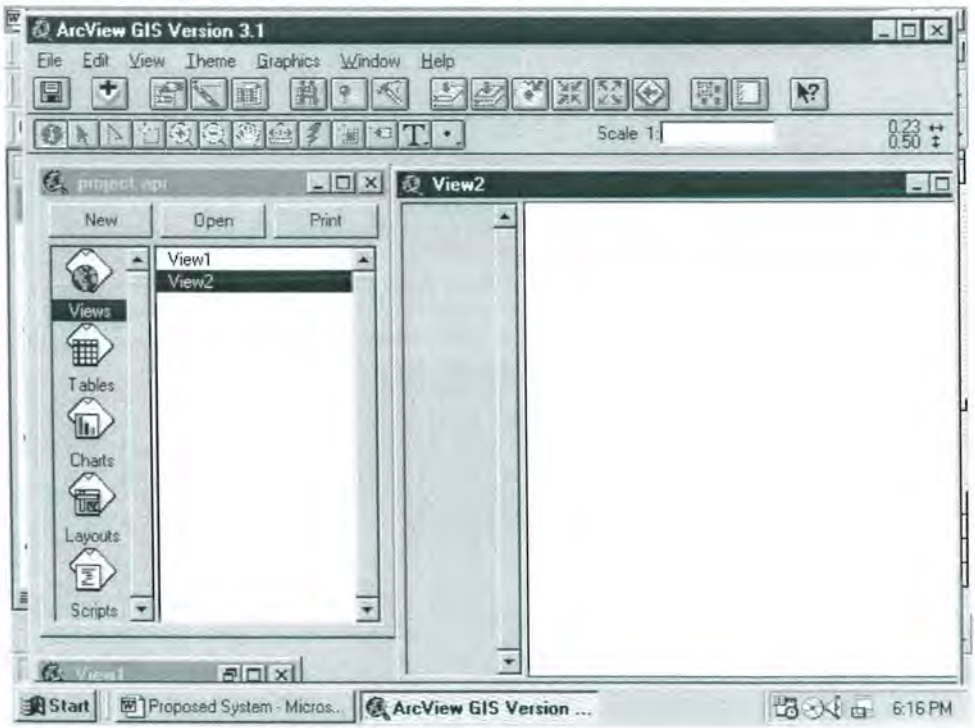
All the components of ArcView session: views, tables, charts, layouts, and scripts are conveniently stored in one file called a project. ArcView's Project window shows you the contents of your project and makes it easy to manage all your work.

10.9 ArcView's User Interface

In ArcView you work with views, tables, layouts, charts and scripts stored in one file called a project. You work with one project at a time in ArcView. Projects enable you to keep all the components together that you need for a specific task or application.

10.10 The Project Window

When you create a new project or open an existing one, a Project window will appear in the ArcView window. This lists all the components of the project and enables you to manage them. Double-click a component's name to open it. The title bar of the Project window shows you the name of the project. See Project window.



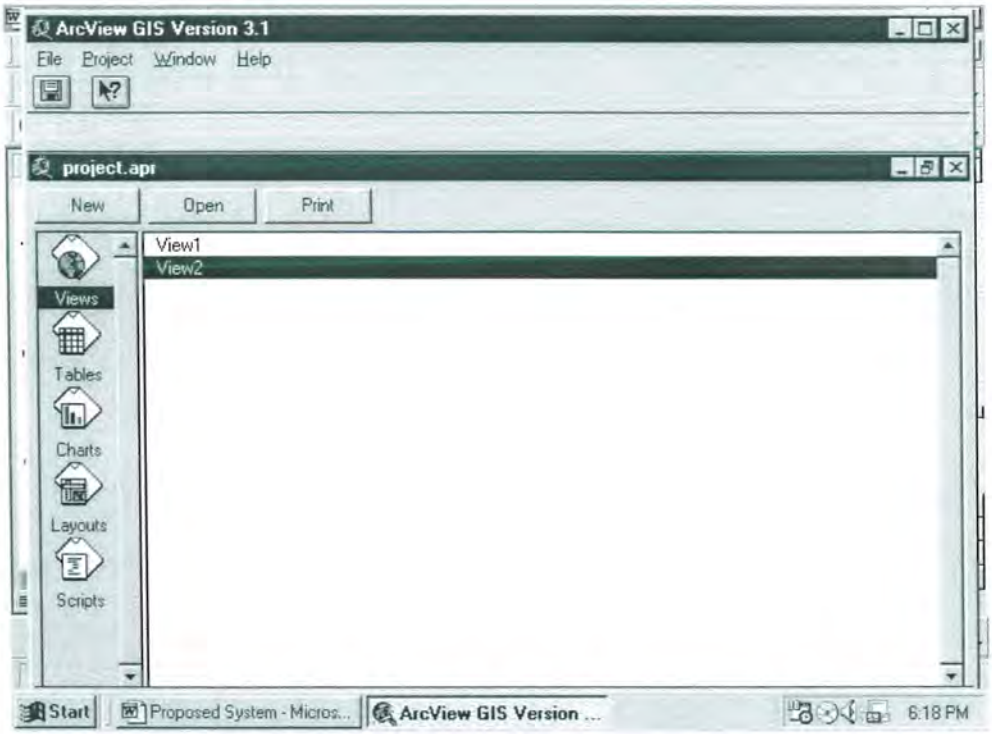
10.11 View, Table, Chart, Layout, and Script Windows

When you open one of the components of a project, it is displayed inside its own window. You can have any number of windows open in ArcView, but at any time there is only one active window. The active window is the window you are currently working with.

All the windows that are currently open inside the ArcView window are listed at the bottom of the Window menu in the ArcView menu bar. The first window in this list is the Project window.

To make a window active, simply click inside it or on its title bar, or choose it from the list in the Window pull down menu at the top of the ArcView window. When you open a window it automatically becomes active. If others hide part of a window, making it active will bring it to the top.

When you perform an action in ArcView, it usually applies to the active window. ArcView's user interface changes according to what is in the active window. So for example, when the Project window is active, you will see the buttons, tools and menus for working with projects.



10.12 Menu Bar

This bar along the top of the ArcView window contains ArcView's pull down menus. To choose a menu choice from a pull down menu, you can use the mouse or a keyboard shortcut. Some keyboard shortcuts are listed in the menus. Others depend on the graphical user interface (GUI) system you are working with. The contents of the menu bar change according to what is in the active window.

10.13Button Bar

This bar located beneath the Menu bar in the ArcView window contains buttons giving you quick access to various controls. Click on a

button to choose it. The contents of the button bar change according to what is in the active window.

10.14Tool Bar

This bar located beneath the Button bar in the ArcView window contains various tools you can work with. If you are working on the Project window or on a script, there is no tool bar. You click on a tool to choose it. This will change the cursor to reflect the tool you have chosen. The tool remains selected until you choose another one. The contents of the tool bar change according to what is in the active window.

10.15The Table of Contents

Each view has a Table of Contents that lists the themes in the view and shows what symbols and colours they are drawn with. You also use the Table of Contents to control how the view is drawn.

10.16What is a View?

A view is an interactive map that lets you display, explore, query and analyse geographic data in ArcView. Views are saved in the ArcView project you are currently working with.

A view defines the geographic data that will be used and how it will be displayed, but it doesn't contain the geographic data files

themselves. Instead, a view references these source data files. This means that a view is dynamic, because it reflects the current status of the source data. If the source data changes, a view that uses this data will automatically reflect the change the next time the view is drawn. It also means that the same data can be displayed on more than one view. For example, you may have one view in your project that displays a city's census tracts classified by population, and another view that shows just the outlines of these census tracts.

A view is actually a collection of themes. A theme represents a distinct set of geographic features in a particular geographic data source. For example, a view showing a country might have one theme representing cities, one theme representing roads, one representing rivers, etc. A view's themes are listed in its Table of Contents.

10.16.1 A Theme

A theme is a set of geographic features in a view. A theme represents a source of geographic data.

10.16.2 Map Scale

Map scale is the relationship between the dimensions of a map and the dimensions of the Earth.

10.16.3 Map Detail

It is natural to equate detail with accuracy. However, when we talk about the level of detail on a map, we are referring to the quantity of geographic information shown. Map accuracy, on the other hand, is a statement of the quality of this information.

10.17 Open or Create a Project

If you have not yet opened a project, choose Open Project or New Project from the File menu.

10.18 Create a New View

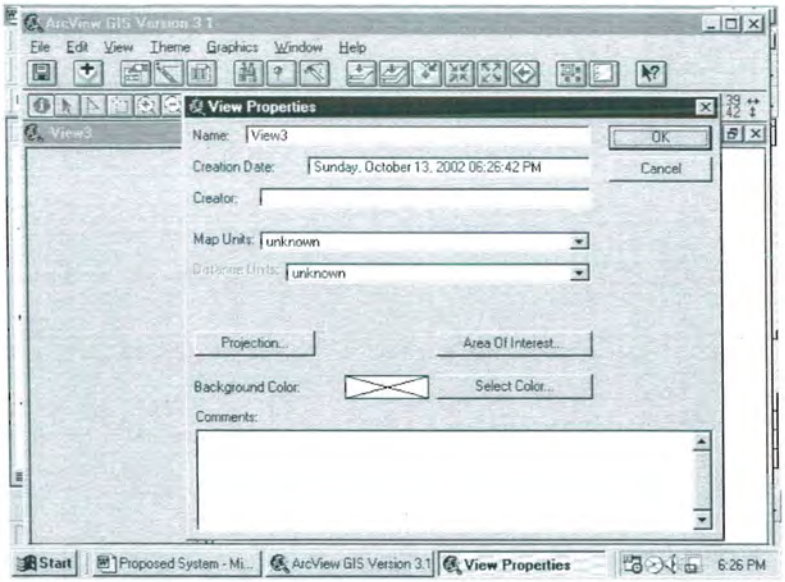
On the Project window, click the Views button and then press the New button. A new, empty view will appear in your project.

10.19 Set the View's Properties

Setting a view's properties lets you change the view's name, store comments about the view, specify the coordinate and measurement units the view will use, specify the map projection that will be used,

10.20 Setting View Properties

By setting a view's properties you can control various view characteristics. View properties can be set and changed at any time. You don't have to set view properties before you add themes or start working with a new view you have created.


ArcView GIS Version 3.1
File Edit View Theme Graphics Window Help
View Properties
View3
Name: View3
OK
Creation Date: Sunday, October 13, 2002 06:26:42 PM
Cancel
Creator:
Map Units: unknown
Distance Units: unknown
Projection...
Area Of Interest...
Background Color:
Select Color...
Comments:
Start
Proposed System - Mi...
ArcView GIS Version 3.1
View Properties
6:26 PM

10.21 STEP BY STEP CREATION OF MAP, DATABASE (GIS)

10.21.1 Use of Scanner

- Colour/Monochrome scanner of A0 size

10.21.2 Steps of map scanning by Using WIDE IMAGE scanning software

Wide Image software, which will be used for scanning purposes. It is used because it provide user friendly interface.

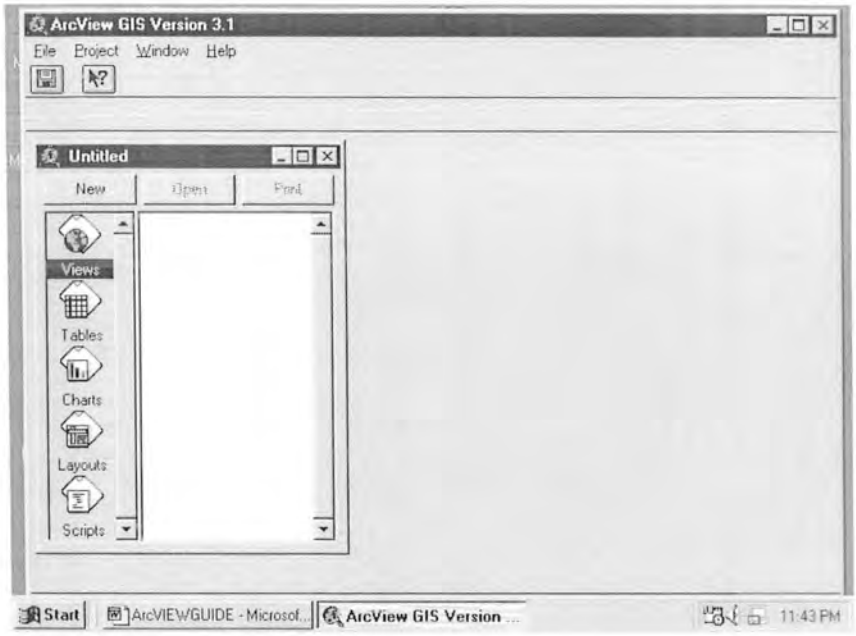
i. Run Wide Image software by double clicking Icon or go from Start, Program, Wide Image.
ii. Click Start Button from menu bare
iii. Give path and file name, which will be store after map as raster image with 'tiff' file format.
iv. Set Resolution form set resolution option as 300 DPI (Dot per Inch)
v. Click Scan button

10.22 Creating a New Map with ArcView

The map, which will has been scanned will be stored with 'tiff' file format.

10.22.1 Open Image file

i. Run ArcView
ii. Click View from Project Window



iii. Click New button

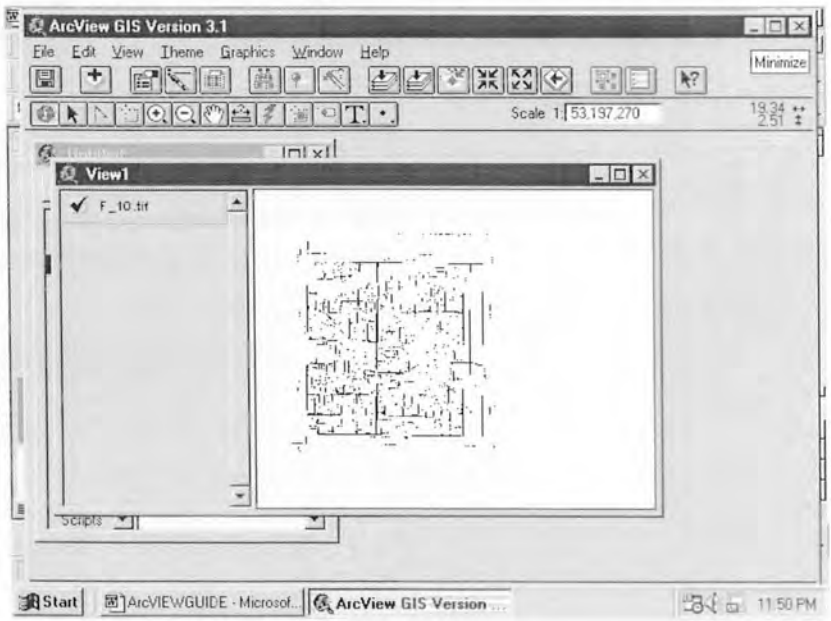
iv. Click View from Menu bar and click Add Theme option

v. Select Image Data Source from Data Source Type option

vi. Select folder form the same dialog Box

vii. Select Required Raster file as E:\Project\F_10.tiff

viii. Now mark ✓ to make the image on/displayable



How to Create New Theme/Layer

i. In the project window click NEW
ii. Click New Theme Button
iii. Select VIEW from Menu Bar
iv. Click NEW THEME
v. Select Feature Type (Polygon)
vi. Select derive, folder, and give name to THEME File
vii. Click Ok
viii. Now start digitising of Area features from raster map by selecting different polygon options (3 in total)

The same practice can be repeated for digitising different features of the map. It is important that different themes should be created for digitising different features of a map.

It is important for GIS developer to have good enough knowledge of mapping.

Following facilities are used to make the digitisation process feasible.

10.22.2 Zoom In and Zoom Out

View (Zoom Options)

a. Full Extend (to fit entire map within the computer screen)
b. Zoom In & Zoom Out (to enlarge or reduce the map vision)

c. Zoom to Theme (to enlarge the vision of the current theme, theme can be made current by clicking with pointer on theme name)

d. Zoom Previous (to come to the recently last position of the zoom)

10.22.3 View Properties

This menu is used to change the name of view, to define map units, to define Distance Units, to define Projection.

10.22.4 Edit Menu

This menu contains following commands:

i. Cut Theme (used to cut theme from View)

ii. Copy Theme (used to make duplicate of the theme)

iii. Delete Theme (to delete theme from the view but not used for physical deletion)

iv. Undo Graphic Edit (to undo to any previously taken action)

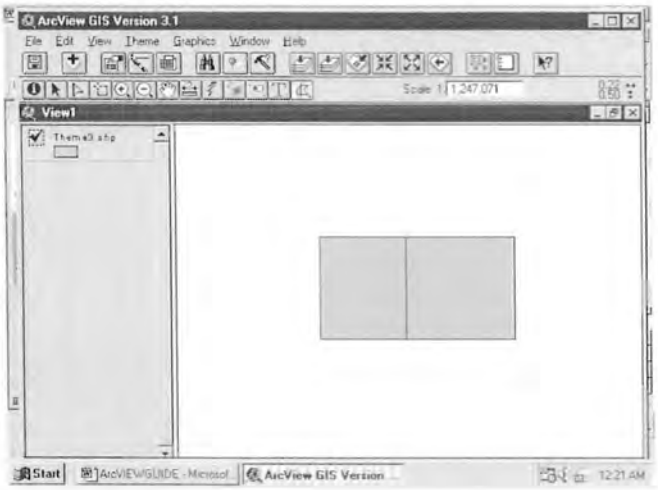
v. Cut Graphic (one theme contains many many features, the option is used to cut any feature or entity from theme.

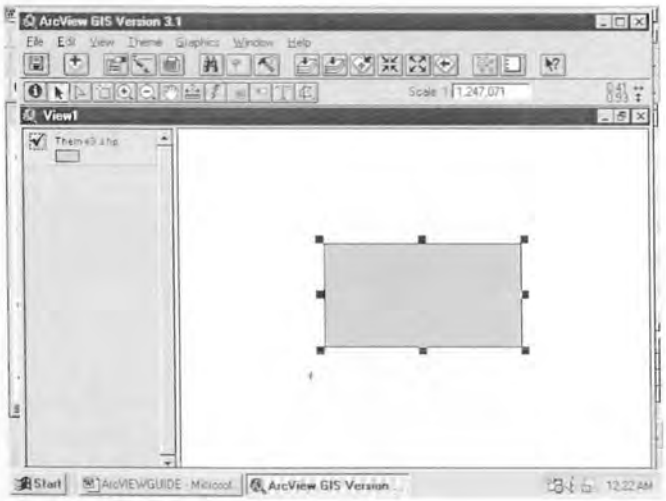
vi. Copy Graphic (this has the same application but used for making duplicate of any feature).

vii. Delete Graphic (this is used to delete any graphic feature from theme.

viii. Combined Graphic (used to make one two or more entities).

Before Combining Graphic





After Combining Graphic

viii. Union Graphic (used to make one to two or more than two line features)

ix. Subtract Graphic (used to delete one feature from bigger one)

x. Past (used to past feature/s on those aforesaid commands have been applied).

10.22.5 Theme

i. Properties (this option is used to rename the theme, redefining theme path, text positioning on map features, Geo-coding, editing, etc).

ii. Stop Editing (if any theme is to be edited then this option is used to make it edit able or un-editable.)

iii. Save Edit or Save Edit As (are used to save editings).

iv. Auto Lable & Remove Label (are used to display names and other contents those are attached with map through tables).

v. Table

vi. Only preparation of digital map is not called GIS. Tables, which contains attribute data are linked with geographic/spatial data and then the simultaneous use of both for analysis purposes is called GIS.

vii. How to Link attribute Data with Geographic/spatial data.

viii. Complete digitisation of a map

ix. Stop editing of map

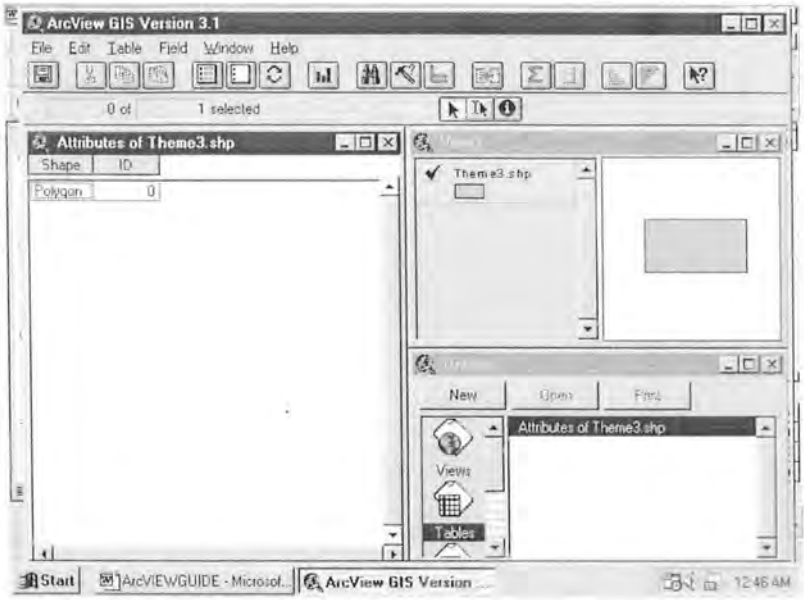
x. Open table by selecting Theme and then Table option from menu bar.

xi. Make the table editable by selecting table, start editing, from menu bar.

xii. Add required number of fields by selecting editing, Add field option from menu bar.

xiii. Select feature with which the relevant attribute detail is to be attached by clicking Select Feature icon from task bar.

xiv. Both map and table windows should be Tiled.



xiv. Click edit button from table's task bar.

xv. Click on subject field and enter data (This process keep continue as per the requirement)

xvi. Data from External Database software i.e. Access. Access data is saved in dbase III file format.

xvii. Open both the tables (ArcView and Access

xviii. Press the foreign keys of both

xix. Make active ArcView Table

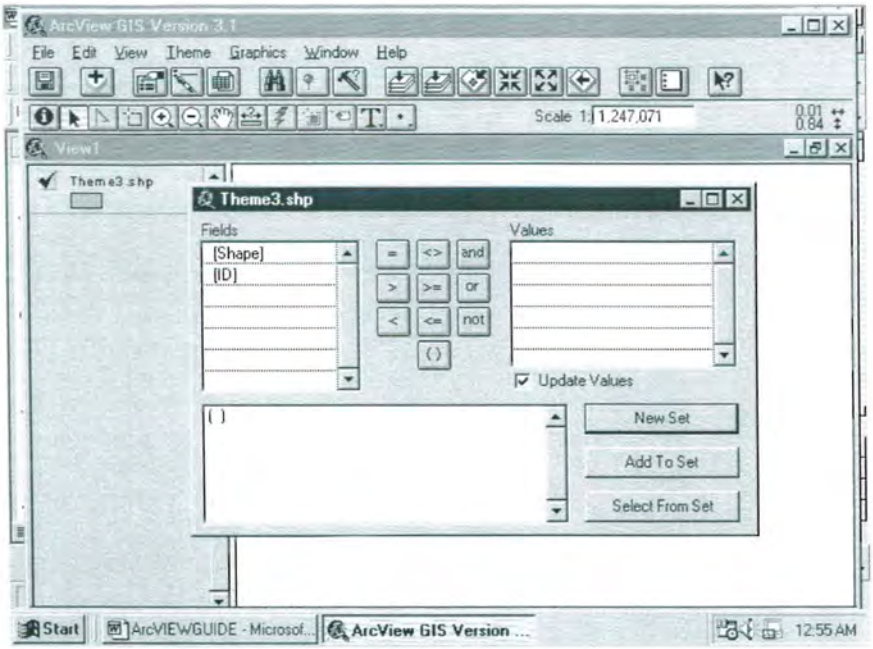
xx. Press Join Button from table's menu bar.

How to Make Queries

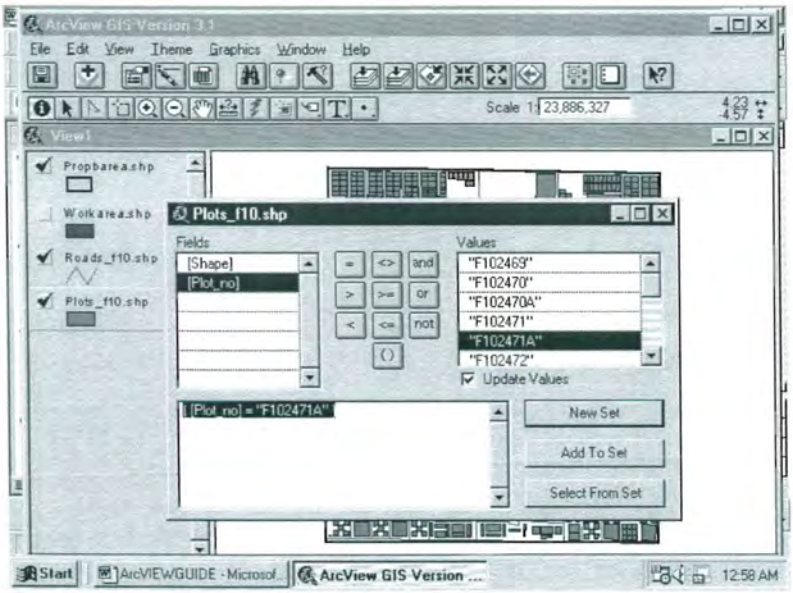
i. Make the theme active on which query is to be applied

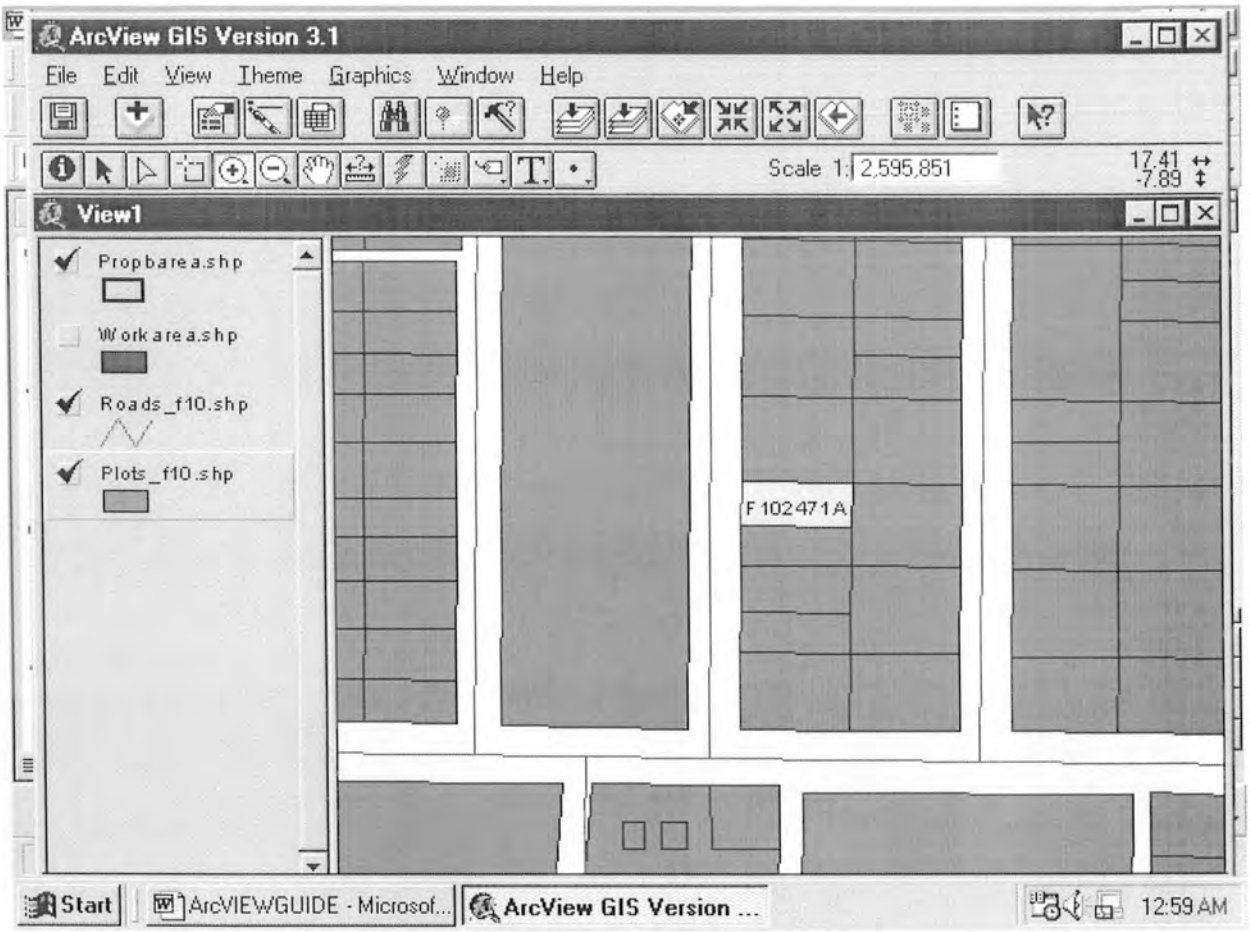
ii. Select Theme Query from Menu bar

iii. Query dialog box will be displayed



iv. Now make query





The feature has been shown in yellow is selected through query.

CHAPTER # 11

BIOGRAPHY OF BOOKS

BIOGRAPHY OF BOOKS

2. GEOGRAPHIC INFORMATION SYSTEMS, 1st Edition, Authors

Ian Heywood
Sarah Cornelius
Steve Carver

Published in the United States of America in 1998 by Pearson Education Inc, New York.

3. INTELLIGENT GIS, First Edition, Authors

Mrk Birkin
Graham Clarke
Martin Clarke
Alan Wilson

Published in Cambridge in 1996 by A division of Pearson Professional Ltd.

4. LAND REGISTRATION AND CADASTRAL SYSTEMS, First Edition Author

Garhar Larsson

Published in UK and USA in 1991 by Longman Group UK limited.

5. ArcView GIS

By ESRI (Environmental Systems Research Institute, Inc. America.

CHAPTET #11
APPENDICES

BATCH MAN DIAGRAM

Sector

Sector	Sub_Sector	Plot_No.	Street	Type	Size

Owner

Serial #	Plot_No	OwnerName	Sex	F_Name	IDNo	PrestAddress	PerAddress	Profession	ResPnone	OffPhone

Land use

Sl. No.	Plot_No	OrigLandUse	PresLandUse	OrigAllotedArea	OrigDate	AddLandArea	AddDate

Land Cost

Sl. No	Plot_No	OrigCost	AddPremCost	InstalAllowed	AdvPayStat	AdvPayment	Date

Land Payment

Sl. #	Plot_No	AdvPayment	AdvDate	Instalments	Inst-I	DueDate_I	PayDate_I	Delay_I	Amount_I	Inst-II	DueDate_II	PayDate_II	Delay_II	Amount_II

Plot Status

Sl. #	Plot_No	Quotas	AllotMode	Date	CurPlotStatus	AppNo	AllotNo	BidRate	PossDate	TransStatus

Plot Division

Sl. #	Plot_No	Sub_Div	Area	SubDivArea	DivDate	Owners

Construction

Sl. #	Plot _No	Plan_Sub_Date	Plan_App_Date	Plan_App_No.	CompStatus	Date	Cons_voilation	Detail

Property Tax

Sl. #	Plot_No	PropTax	IssueDate	Period	PayDate	Delay	charhes	Amount	Receipt

Water Charges

Sl. #	Plot_No	Water _Charge	Issue_Date	Period	DueDate	PayDate	DelayCharages	Amount	Receipt

Transfer of Plot

Sl. #	Plot_No	NumbTrans	Name	NIC	F_Name	Date	Address	Profession	ResPhone	OffPhone	TransNo

Financial status of Transfer

Sl. #	Plot_No	Transfer_Type	Transfer_Fee	Paid	ReceiptNo

CHAPTER # 13

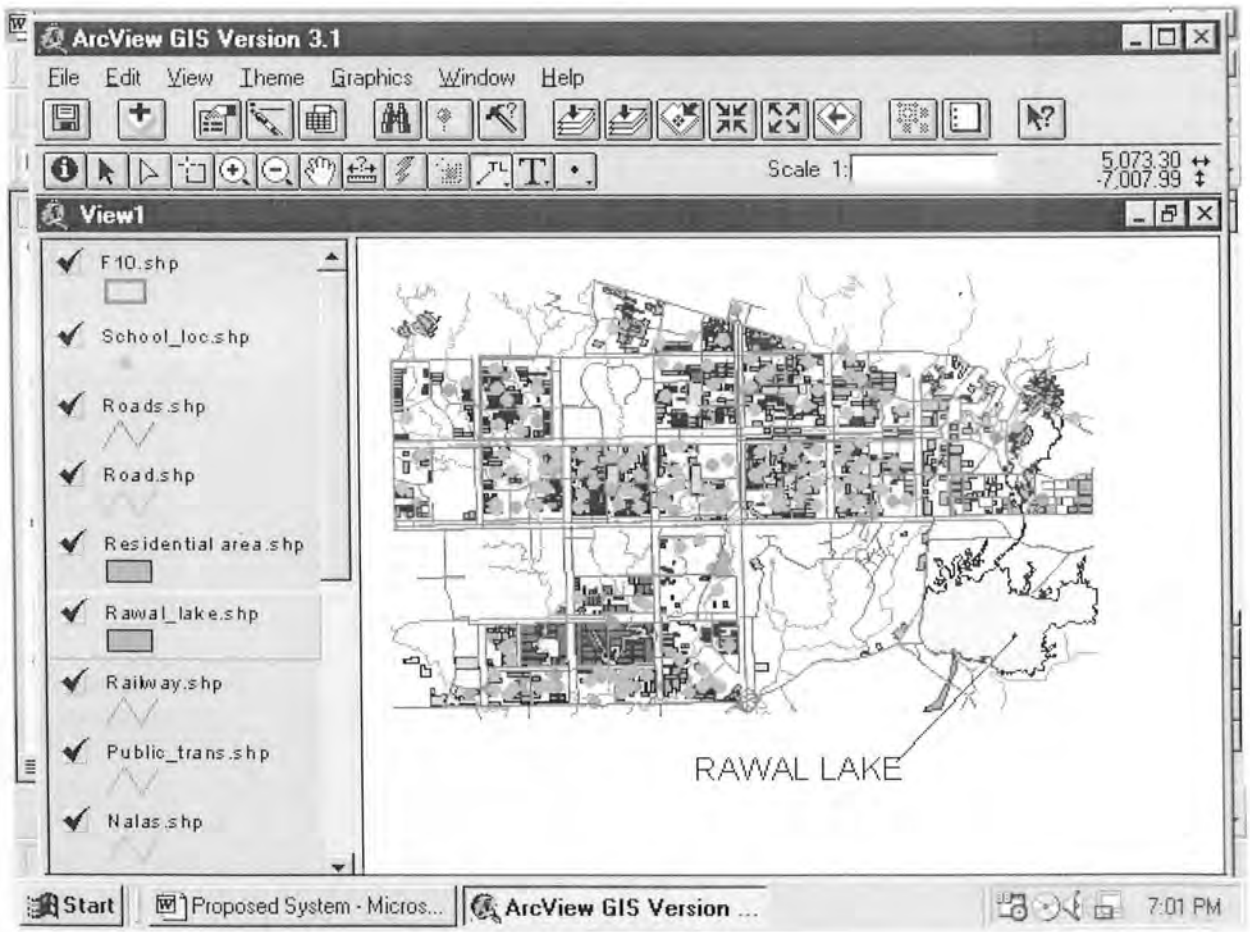
QUERIES

QUERIES

Geographic/spatial data is extracted with the help of queries by using query option.

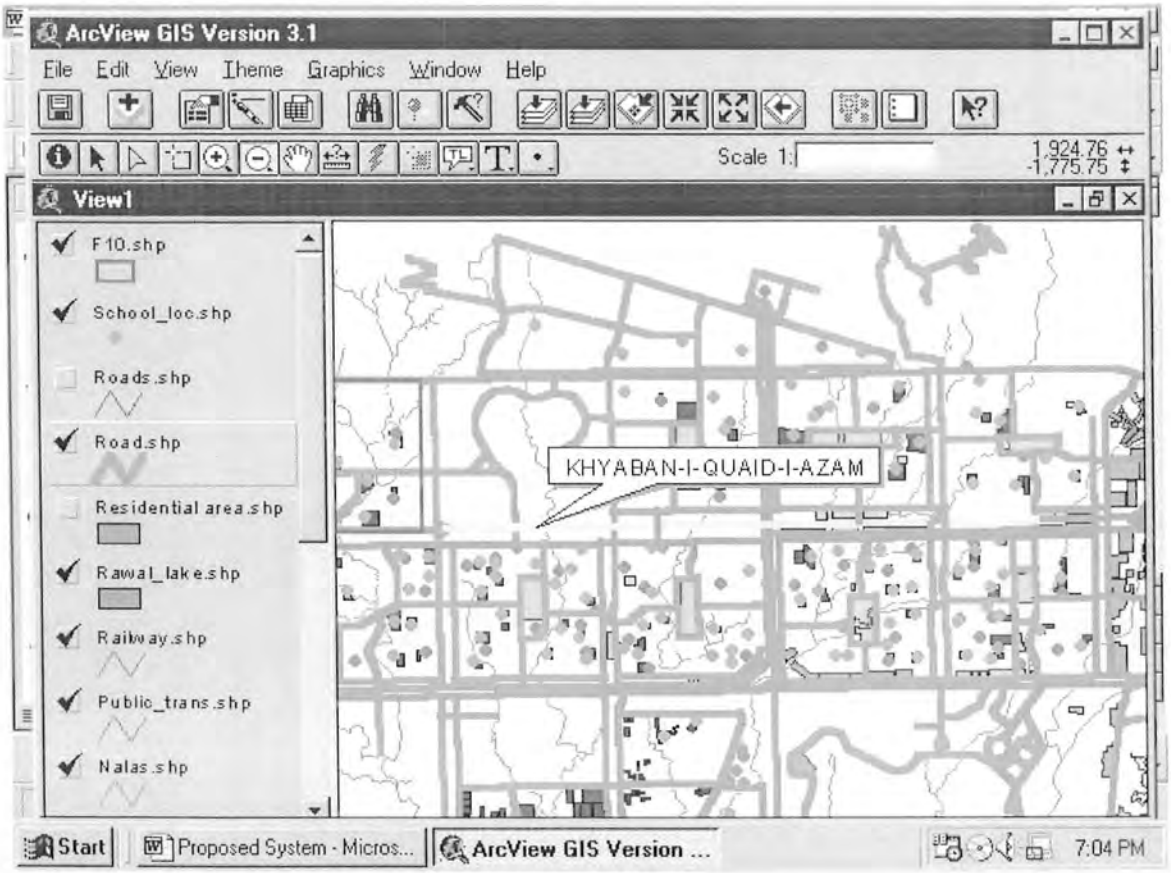
What is geographical location of Rawal Lake

([Lake] = "RAWAL LAKE")

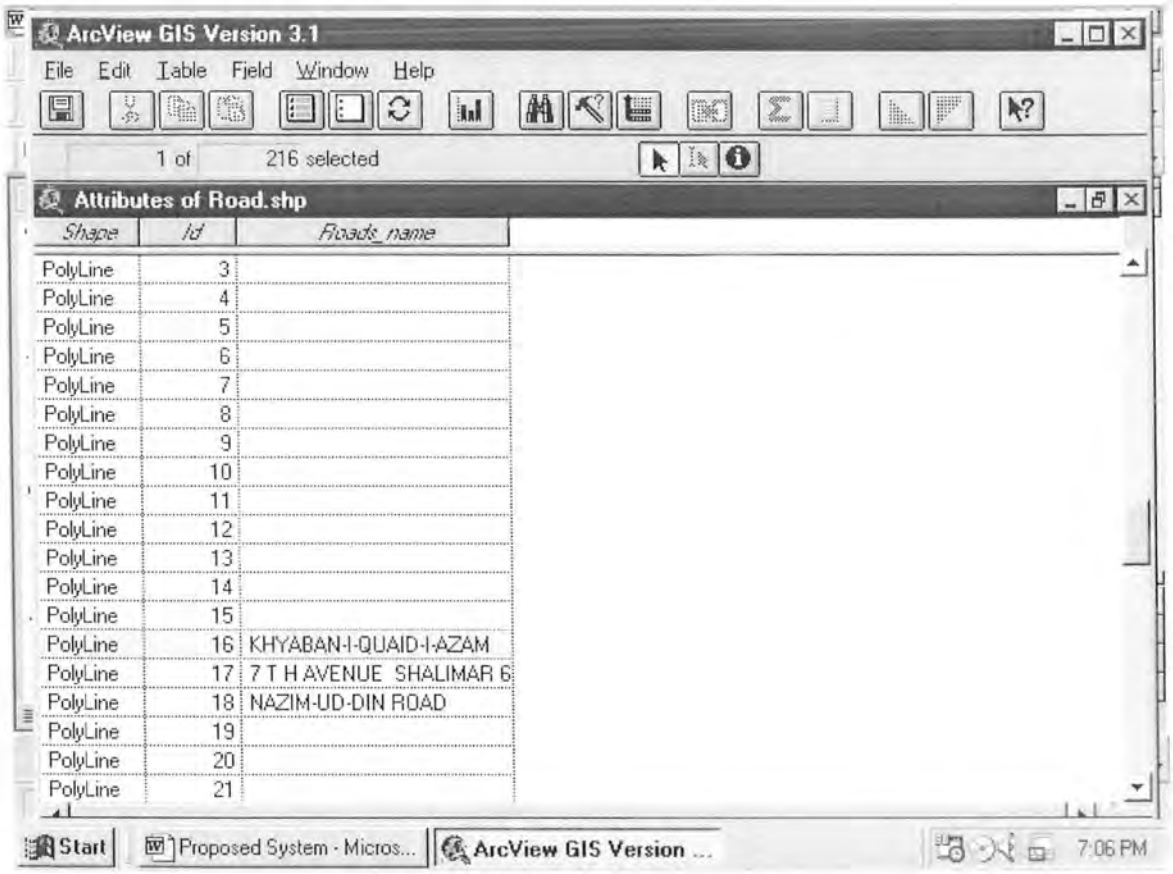


([Roads_name] = "KHYABAN-I-QUAID-I-AZAM")

Geographic information

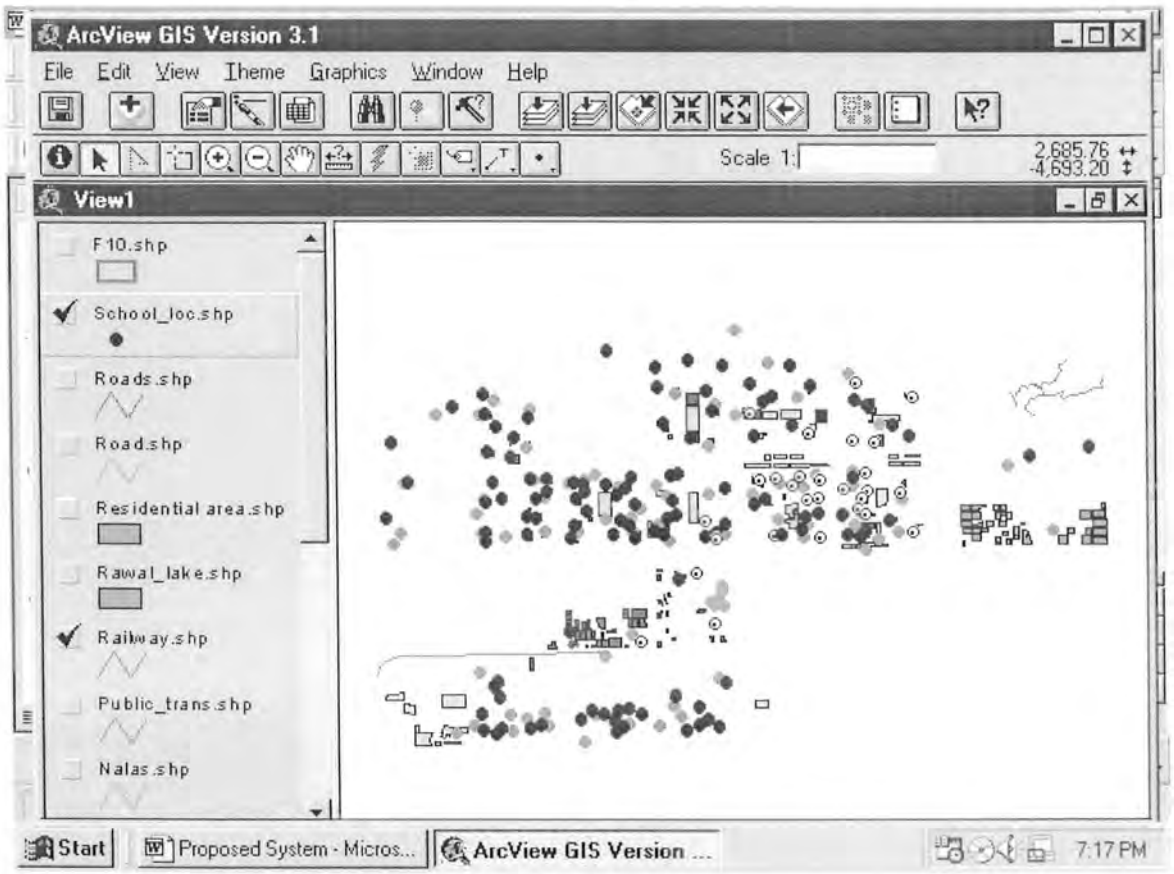


Tabular information

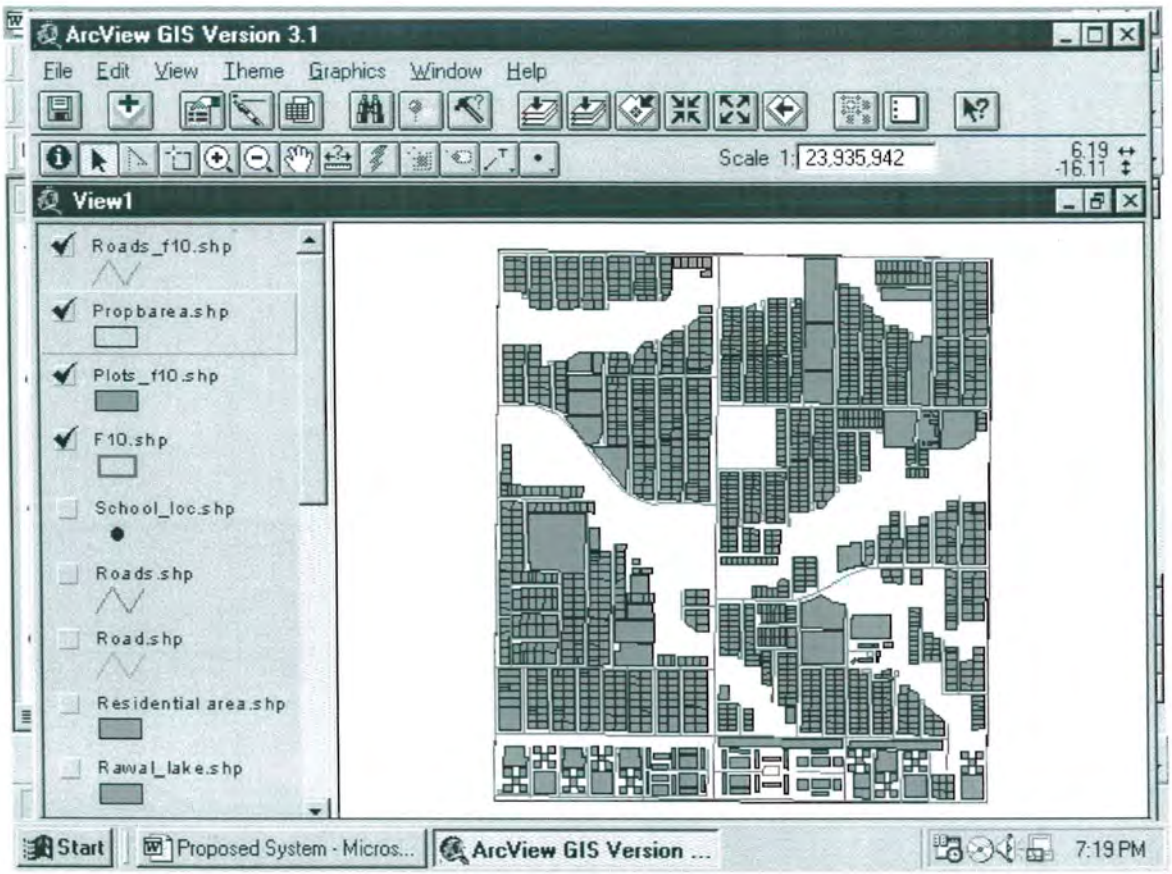


Schools established in/after 1965 and in / before 1974

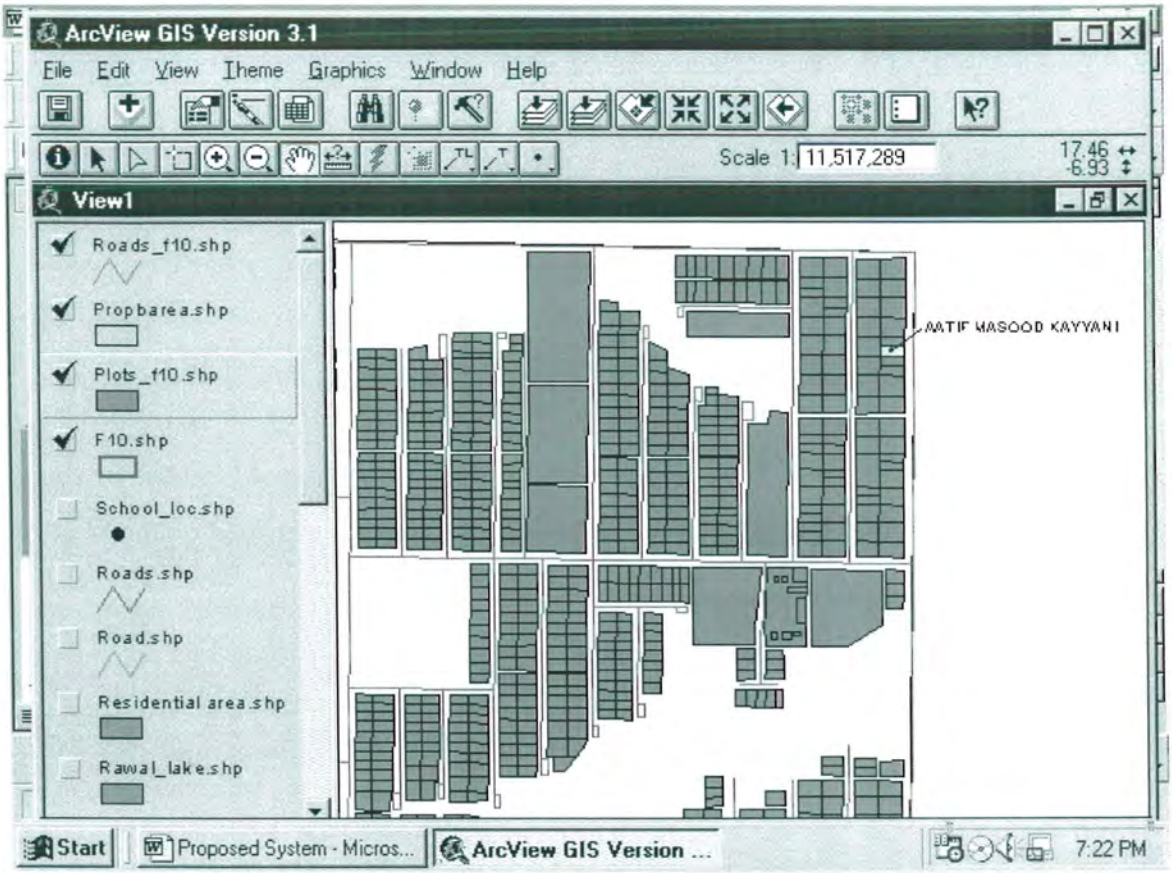
[Establishe] >= "1965") and ([Establishe] <= "1974")



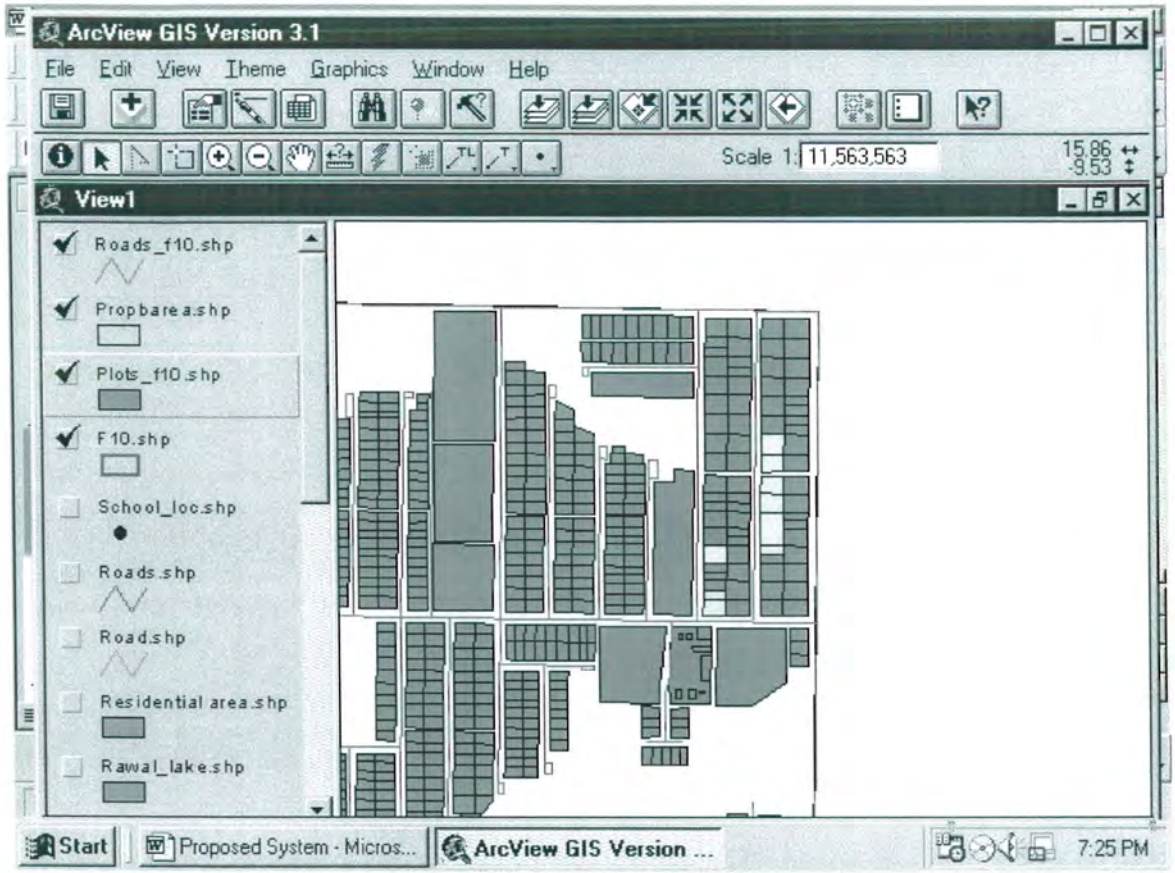
Sector F-10


ArcView GIS Version 3.1
File Edit View Theme Graphics Window Help
Scale 1: 23,935,942
6.19
-16.11
View1
Roads_f10.shp
Propbarea.shp
Plots_f10.shp
F10.shp
School_loc.shp
Roads.shp
Road.shp
Residential area.shp
Rawal_lake.shp
Start
Proposed System - Micros...
ArcView GIS Version ...
7:19 PM

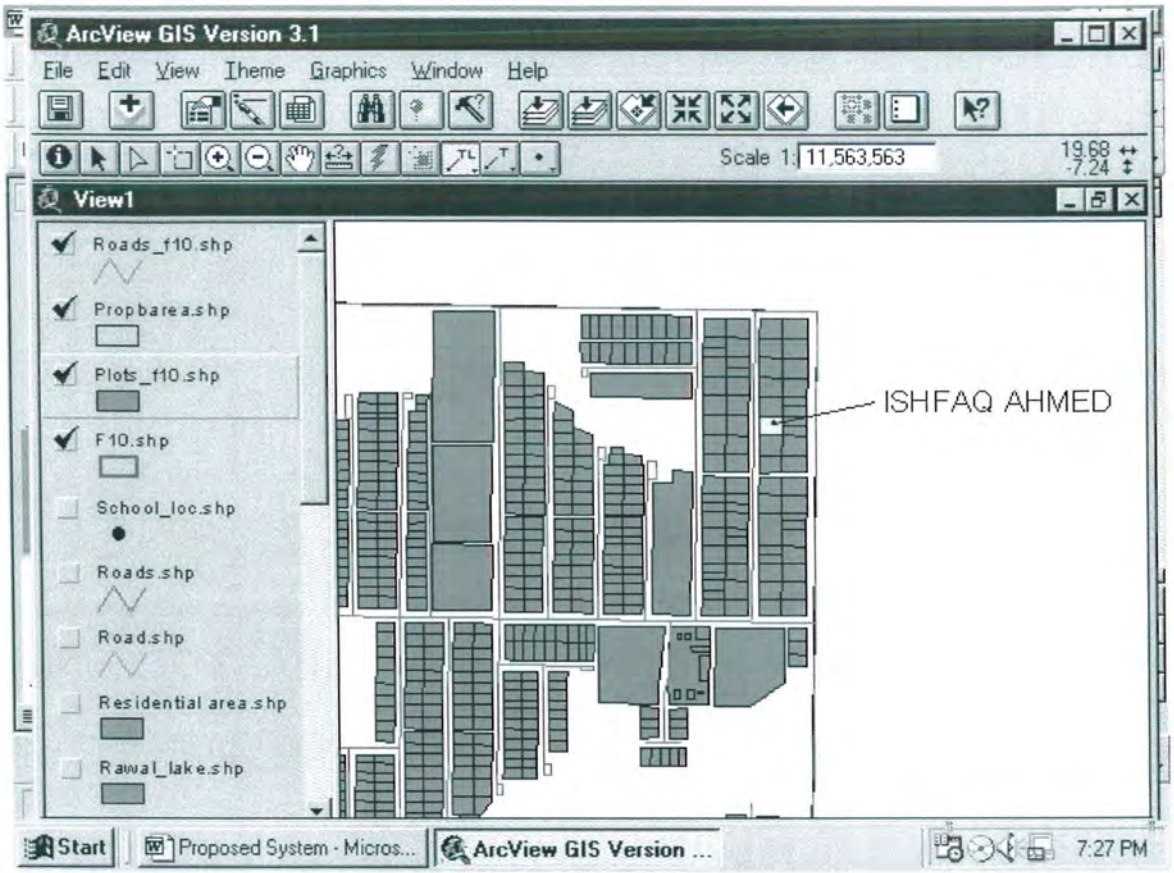
([Ownername] = "AATIF MASOOD KAYYANI")



([Profession] = "Govt Service")



([Id_n0] = "122 77 689255")



[Peraddress] = "27 JABBAR SHAHEED HOSTEL 19A WAH CANTT.")