Acknowledgement

All the praises and thanks be to Almighty Allah (SWT), the most gracious the most merciful, who gave me the courage and patience to accomplish this work. May the peace and blessings of Allah be upon Prophet Muhammad (PBUH), his family, and his companions.

I would like to express deep appreciation and thanks to every single person who has participated in providing valuable information.

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1.0 Introduction

Planning is basically about the development and use of land. It is the resolution of the many, and often conflicting pressures on land and resources. The twentieth century has witnessed great innovations in the field of communications. One of which is the development of Geographical information system in the late 1960's. Representation of the world with its attribute information became a good way to perform several tasks. Role of Geographical Information System (GIS) in the different fields of human welfare has been accepted universally during the last 2-3 decades. Geographical information systems are computer-based systems that are used to store and manipulate geographic information and the technology has developed so rapidly over the past 2 decades that it is now accepted as an essential tool for the effective use of geographical information. GIS combines layers of information about a place to give you a better understanding of that place. It lets you visualize information on new ways that reveal relationships, patterns and trends not visible with other popular systems. Its capability to link descriptive information with maps makes it a natural solution. The rapid diffusion of GIS technology witnessed in recent years has facilitated and promoted its use in decision-making. Arc View GIS is a desktop geographic information system (GIS) from ESRI. A GIS is a database that links information to location (it connects the what to the where), allowing you to see and analyze data in new and useful ways. The Arc View interface consists of windows that present information in different ways as required by the user. Arc View's graphical interface lets you point and click to perform almost every operation.

2.0   Statement of the Problem

The basic problems to be discussed here is representing Rakah Action Area near Dammam in various forms of services and also create database for various features relating to the attribute table in ArcView GIS. The project will be based on two types of areas available for the existing site. One for land use and other for the proposed existing land use. The purpose of this study is to locate type of service available in Commercial and Non-Commercial area. This will be performed by modeling the area with respect to its category and also create a database to get the information about it.

3.0   Literature Review

Essentially, a GIS is a computer-assisted information management system of geographically referenced data. It contains two closely integrated databases: one spatial (locational) and the other attribute (statistical). The spatial database contains information in the form of digital coordinates, usually from maps or from remote sensing. These can be points, lines, or polygons. The attribute database contains information about the characteristics or qualities of the spatial features, for example, demographic information, poverty rates, and number of teachers at a school. Different definitions have evolved through the years. GIS is sometimes seen as a set of tools for analyzing spatial data.(Grand Valley State University,1998). Arc View GIS is a desktop GIS package from ESRI.

The key features of Arc View are:

- Easy-to-use interface
- Integrate charts, maps, tables, and graphics
- Dynamic data updating
- Exceptional analysis capabilities
- High-end address matching and geocoding
- Robust editing environment
- Geographic hot links to all supported data formats
- Integrate images, CAD, map data, tables, and SQL databases
- Seamless client/server access to data warehouses
- Extensible architecture
- Completely customizable
- Comprehensive developer environment
- Projection utility.

The following figure shows a project done in the City of Federal Way for City Land Use and current public projects using the ArcView software.
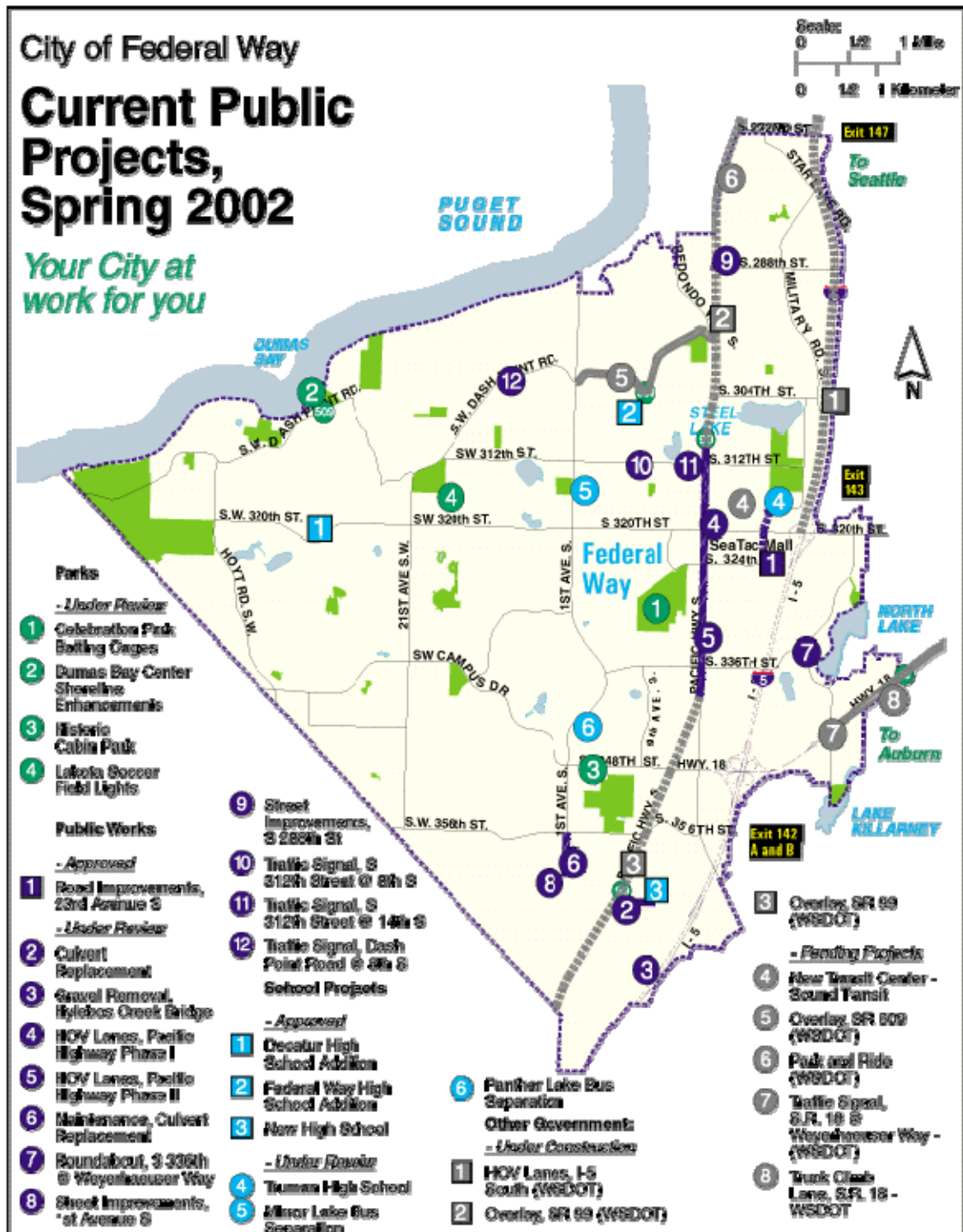
The following map represents the with City of Federal Way for City Land Use and current private projects the various forms of its services.

City of Federal Way
Current Private Projects, Spring 2002
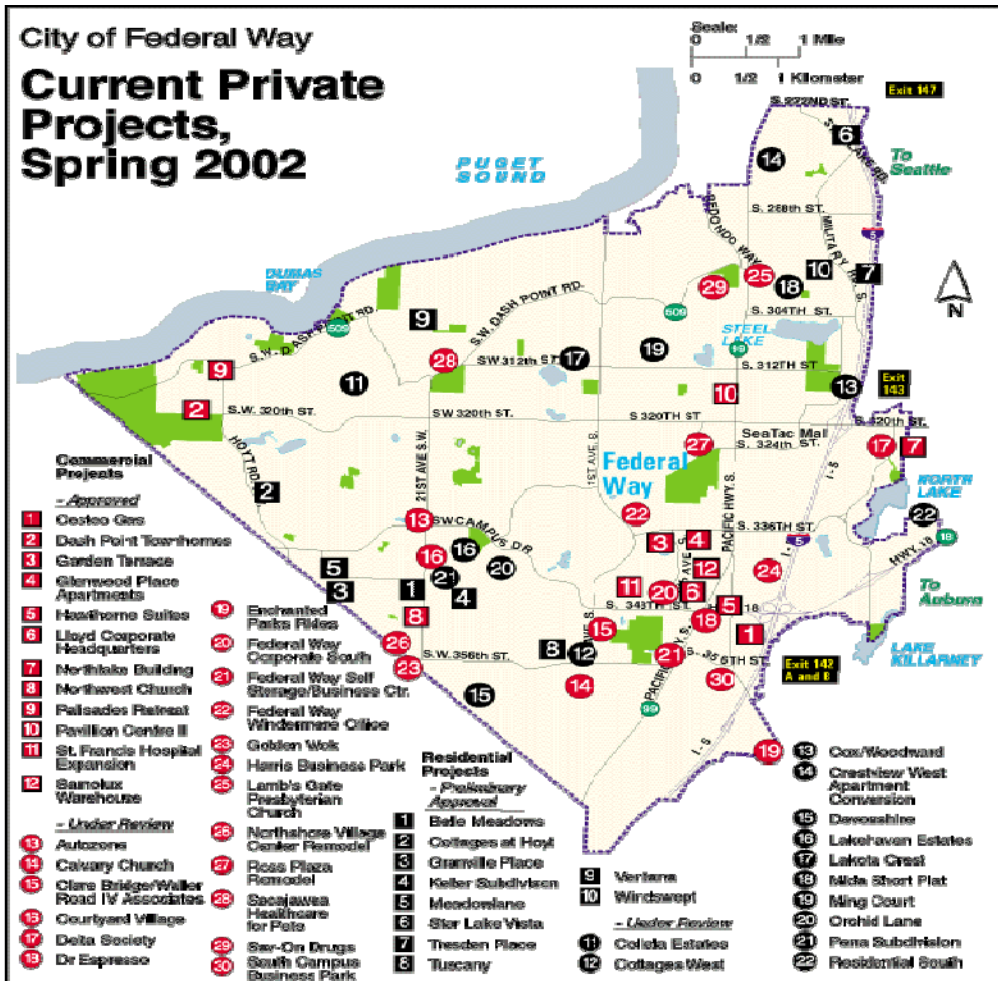
4.0   Geographic Information

Geographic Information can be defined as data that specify location of geographic features and their descriptive attributes. (Baqer Al- Ramadhan, 2001). It is the information about any existing entity in the form of a paper map and attributes either on the map or separately in another sheet. These are generally available in hardcopy format.

5.0   Geographic Information Systems

Geographic Information Systems are a "a powerful set of tools for storing and retrieving at will, transforming and displaying spatial data from the real world for a set of purposes". . .Peter Burrough

"Automated systems for the capture, storage, retrieval, analysis, and display of spatial data" . . . Clark

"an information system that is designed to work with data referenced by spatial or geographic coordinates. In other words, a GIS is both a database system with specific capabilities for spatially-referenced data, as well as a set of operations for working with data" . . . Jack Estes & Jeffrey Star.

"a special case of information systems where the database consists of observations on spatially distributed features, activities or events, which are definable in space as points, lines, or areas. A geographic Information System

manipulates data about these points, lines, and areas to retrieve data for ad hoc queries and analyses" . . .Dueker.

". .the generic issues that surround the use of GIS technology, impede its successful implementation, or emerge from understanding of its potential capabilities." . . . Goodchild. (Grand Valley State University,1998)

A GIS combines layers of information about a place to give you a better understanding of that place. What layers of information you combine depends on your purpose—finding the best location for a new store, analyzing environmental damage, viewing similar crimes in a city to detect a pattern, and so on. (ESRI,2002)
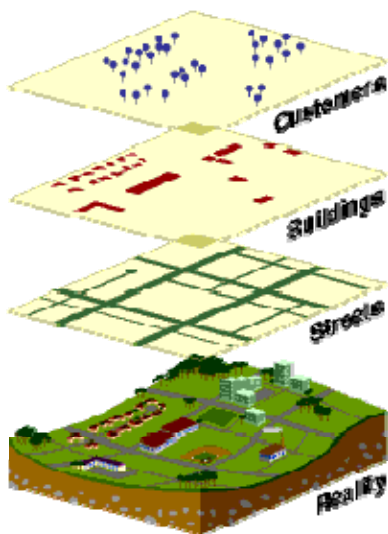
6.0   How does a GIS work?

6.1   By relating information from different sources

A GIS uses information from many different sources, in many different forms for analysis. The primary requirement for the source data is that the locations for the variables are known. Location may be annotated by x, y, and z coordinates of longitude, latitude, and elevation, or by such systems as ZIP codes or highway mile markers. Any variable that can be located spatially can be fed into a GIS.

A GIS can also convert existing digital information for use in maps. For example, digital satellite images can be analyzed to produce a map like layer of digital information about vegetative covers. Census or hydrologic tabular data can be converted as layers of thematic information in a GIS. (Grand Valley State University,1998)

6.2   By capturing data in severel different forms

Various techniques can capture the information.

- Maps can be digitized.
- Maps can be hand-traced with a mouse to collect the coordinates of features.
- We can use electronic scanning devices that will convert map lines and points to digits.

6.3 By linking and integrating data

A GIS makes it possible to link, or integrate, information that is difficult to associate through any other means. Thus, a GIS can use combinations of mapped variables to build and analyze new variable

6.4 By creating maps through projection and registration

Map information in a GIS must be manipulated so that it fits with information from other maps. Before the digital data can be analyzed, they may have to undergo other manipulations - projection conversions, for example - that integrate them into a GIS.

A projection is a mathematical means of transferring information from the Earth's three-dimensional curved surface to a two-dimensional medium. Different projections are used for different types of maps because each projection is particularly appropriate to certain uses. Much of the information in a GIS comes from existing maps. A GIS processes digital information gathered from sources with different projections to a common projection.

6.5 By establishing common data structures

Raster data files consist of rows of uniform cells coded according to data values. Digital data are collected and stored in various ways. The two data sources may not be entirely compatible, so a GIS must be able to convert data from one

structure to another. The computer can manipulate raster data files quickly, but they are often not very detailed nor visually appealing. Vector data files can approximate the appearance of more traditional hand-drafted maps. Vector digital data exist as points, lines, or polygons (shapes bounded by lines).

6.6 Data modeling

Through a process known as data modeling a GIS can relate map features at different points to show two- and three-dimensional characteristics of the Earth's surface, sub-surface, and atmosphere from information points.

7.0 What is a GIS useful for?

A GIS can be used to investigate questions about:

- **Location** (what are the attributes at a specific place?)
- **Condition** (where are the sites that possess certain attributes?)
- **Trends** (how do attributes change spatially over time?)
- **Routing** (what is the shortest/least expensive/most cost-effective path between places?)
- **Patterns** (what is the distribution of attributes and the process/reason accounting for their distribution?).

A GIS can also be used to simulate "what if" scenarios (modeling).

8.0 Tools of Study

ArcView is made by Environmental Systems Research Institute (ESRI), the makers of ARC/INFO, the leading geographic information system (GIS) software. Environmental research system institute located in New York, USA as the vendor of products like ArcView, ArcInfo and ArcGIS has created rapid development in the world of GIS. ArcView was used here for the project. ArcView, a powerful, easy-to-use tool that brings geographic information to your desktop. ArcView gives you the power to visualize, explore, query and analyze data spatially.

9.0   Methodology

The Methodology adopted was as follows:

✓ The digitized map of the study area i.e. Rakah Action Area, Dammam was taken to work on with.

✓ ArcView was used so as to create various shape files in the form of layers and then they were added to the document and worked on with.

✓ The layers were generated for the various parking areas, residential areas, institutional and various services. Also there were attribute tables created for each of these layers and some hypothetical data were added as due to not availability of data.

- ✓ The layers developed showed information about the land use and proposed existing land use was done in much detail manner with layers shown for Community Park, Services, Institutional and Residential.
- ✓ As due to non-availability of data and also limited time, the analyses were carried out by the use of hypothetical data.
- ✓ The maps generated are shown in the figures attached at the end.

10.0 Analysis

Although not much analysis were done as due to shortage of data but still as a part of the requirement there was some hypothetical data introduced in the attribute tables .

11.0 Conclusions and Recommendations

The task structure enforced by current GIS softwares does not match the way experts approach GIS problems. In an Arc View GIS, it is possible not only to create different features but also to maintain a database of the features in an attribute table so as to get the information of any of the features selected either on the map or in the table. This property of any GIS makes it a very powerful tool for any sort of spatial analysis, as just by a click it is possible to get most of the information of any feature anywhere in the world. Also the attributes can be used to create thematic maps i.e. Maps in which colors or other symbols are applied to features to indicate their attributes.

The project was done as a part of the requirement for the course and non-availability of the relevant data for the area created difficulty for

analysis Using of ArcView for the course made me familiar with the new software and the subsequent help and guidance of Dr. Baqer Al- Ramadhan help me in completing this project within the stipulated time. The help provided by some of my colleagues is also appreciable. The task structure enforced by current GIS softwares does not match the way experts approach GIS problems. Given these findings, we should be able to augment GIS educational programmes to better prepare practitioners to use the powerful capabilities of GIS effectively, thus enhancing the benefits of this technology for society.

Appendix

Plan Layout

Rakah Action Area Land Users

Landuse.shp
- H.Commercial
- Institutional
- L. Commercial
- Residential
- Sports & Recreat

Proposed projects.shp
- Community Park
- Higher Education
- Maternity Clinic
- Neighbourhood Pa
- Parking area
- Police Station

N
W   E
S

Tables

Table1 – Land use

Shape	ID	Type of Service	No of Floors	Area
Polygon	0	Residential	2	1000
Polygon	0	Residential	3	300
Polygon	0	Residential	2	400
Polygon	0	Residential	2	600
Polygon	0	Residential	2	300
Polygon	0	Residential	2	400
Polygon	0	Residential	2	750
Polygon	0	Residential	2	800
Polygon	0	Residential	3	650
Polygon	0	Residential	2	700
Polygon	0	Residential	1	750
Polygon	0	Residential	1	800
Polygon	0	Residential	1	850
Polygon	0	Residential	1	800
Polygon	0	Residential	1	800
Polygon	0	Residential	1	900
Polygon	0	Residential	2	700
Polygon	0	Residential	2	800
Polygon	0	Residential	3	500
Polygon	0	Residential	1	600
Polygon	0	Residential	2	650
Polygon	0	Residential	2	700
Polygon	0	Residential	2	800
Polygon	0	Residential	1	800
Polygon	0	Residential	1	600
Polygon	0	Residential	2	700
Polygon	0	Residential	1	800
Polygon	0	Residential	1	700
Polygon	0	Residential	2	800
Polygon	0	Residential	1	1000

Polygon	0	Residential	2	700
Polygon	0	H.Commercial	1	1200
Polygon	0	H.Commercial	2	600
Polygon	0	H.Commercial	2	800
Polygon	0	H.Commercial	2	800
Polygon	0	H.Commercial	2	900
Polygon	0	H.Commercial	2	600
Polygon	0	H.Commercial	2	900
Polygon	0	H.Commercial	1	2000
Polygon	0	H.Commercial	2	900
Polygon	0	L. Commercial	2	600
Polygon	0	L. Commercial	2	700
Polygon	0	L. Commercial	2	750
Polygon	0	Residential	1	700
Polygon	0	L. Commercial	2	550
Polygon	0	L. Commercial	2	600
Polygon	0	L. Commercial	2	600
Polygon	0	L. Commercial	1	500
Polygon	0	L.Commercial	1	600
Polygon	0	Residential	1	600
Polygon	0	L. Commercial	2	800
Polygon	0	Residential	1	600
Polygon	0	Residential	1	700
Polygon	0	Sports & Recreat	2	600
Polygon	0	Sports & Recreat	2	800
Polygon	0	Sports & Recreat	1	400
Polygon	0	Sports & Recreat	1	400
Polygon	0	Sports & Recreat	1	300
Polygon	0	Sports & Recreat	2	600
Polygon	0	Sports & Recreat	2	650

Polygon	0	Institutional	2	400
Polygon	0	Institutional	2	400
Polygon	0	Institutional	2	600
Polygon	0	Institutional	1	500
Polygon	0	Institutional	2	800
Polygon	0	Institutional	1	300
Polygon	0	Institutional	2	700
Polygon	0	Institutional	2	800
Polygon	0	Institutional	2	500
Polygon	0	Institutional	2	1000
Polygon	0	Institutional	2	450
Polygon	0	Institutional	2	600
Polygon	0	Institutional	2	600
Polygon	0	L. Commercial	1	450
Polygon	0	H. Commercial	1	600

Table 2

Proposed Project

ArcView GIS 3.2a

File Edit Table Field Window Help

0 of 6 selected

Attributes of Proposed projects.shp

Shape	ID	Type of Service	Area	No of floors
Polygon	0	Neighbourhood Pa	500	1
Polygon	0	Police Station	400	1
Polygon	0	Maternity Clinic	300	4
Polygon	0	Community Park	1000	0
Polygon	0	Higher Education	6000	4
Polygon	0	Parking area	700	0

References

1. Grand Valley State University, "*Geographical Information System*", 1998

    http://www.gislinx.com/whatisgis.shtml

2. Dr. Baqer Al-Ramadan, " *Introduction to GIS* ", 2001.

3. ESRI, "*Geographic Information System*", *2002*

    http://www.gis.com/whatisgis/

4. ESRI," Geographic Information Systems ', 2002,

    http://www.esri.com/

5. Getting to know ArcView GIS tutorial.

6. GIS Projects , 2002

    http://www.ci.federal-way.wa.us/depts/ms/gis/