

## **Cadastral maps between past and present, and the possibility of updating them with modern technologies An applied study province No.8 Al-Habbaniyah District.**

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### **ABSTRACT:**

Maps are of great importance in the field of geographical studies because of the data they provide or represent, and (cadastral) maps have a share of this importance, as they form the cornerstone for conducting local studies and research on land use, which helps to lay the foundations for conducting a comprehensive survey of land uses in any country, where its importance lies in designing, updating and developing the urban planning of the city as it contains all the elements and natural contingencies in the region, and as a result of the urbanization, investment and construction movement in Iraq, the need to produce digital maps instead of the old paper maps that are still used until now in some government institutions in order to keep pace with the technical progress and the technological revolution. What happened in most of the developed countries of the world, as the great development of software and computer equipment removed many obstacles in the production of maps, as it provided the possibility of linking data and information to their geographical locations through coordinates, as well as the capabilities of measurement, analysis and interpretation from aerial photos and panels sent from satellites, data and information extraction and the creation of maps including it to save effort, time and money.

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### **INTRODUCTION**

Maps in general and Cadastral maps in particular are a distinguished source for obtaining data and information, Therefore, attention must be paid to knowing the date of the survey on which the map was drawn, because its preparation takes a long time and the cadastral maps that were drawn in Iraq for some areas at the beginning of the twentieth century, It was not updated, although there have been many changes in the landscape of the landscape in its regions.

In order to make the most of these maps, we must work to update them using modern technologies and software, which have changed many scientific applications in an amazing way that made it easy to reach results that were never expected, Now it has become easier and easier to purchase satellite visuals (images of the earth's surface taken from satellites) or obtain them free of charge from some sites where the most accurate details of the spatial features of any spot on the surface of the earth are shown, This made the production of maps reach levels of accuracy and speed that were unimaginable even years ago.

As for field measurements, it no longer takes all this time and economic cost with the emergence and spread of the Global Positioning System (known as GPS) technology, and of course, this has been reflected in the production of maps, both in terms of accuracy and speed.

#### **The study area in the research**

##### **Geographically:**

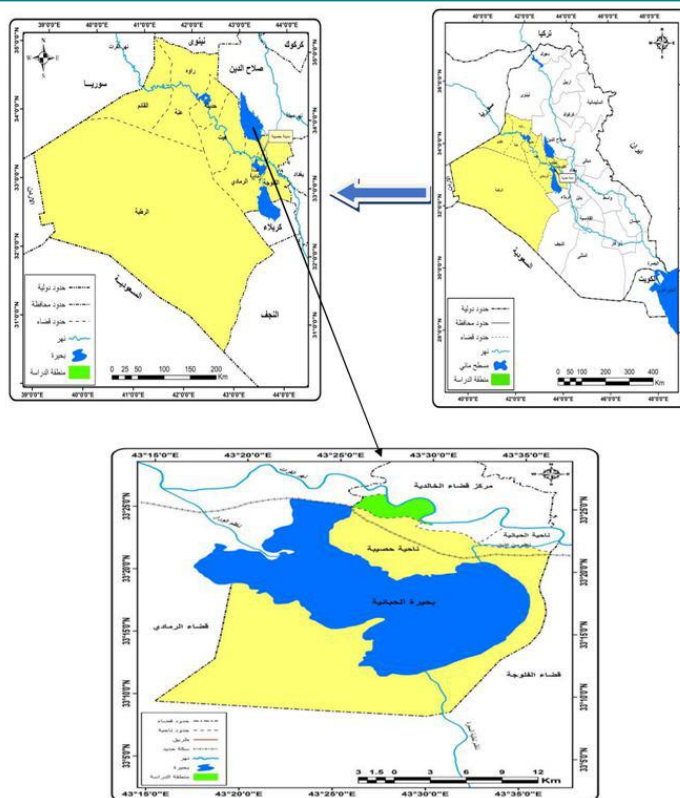
The study area is located in the central part of Iraq and occupies the northeastern part of Anbar Governorate, 90 km away from the capital Baghdad, and it is located 15 km east of Ramadi. It should be noted that it is located on the right bank of the Euphrates River.

It also overlooks Lake Habbaniyah. It is bordered to the north and northeast by the city of Khaldiya, to the east by the district of Fallujah, and to the west by the district of Ramadi, as shown in Map No. (1).

##### **Astronomically:**

The study area is located astronomically between latitude (33-2600) and (33-080) north. And between the longitude lines 1500 433 and 370 43E.

#### **Map No. (1) of the location of the study area**



Source: - Ministry of Irrigation, Public Survey Directorate, Iraq Administrative Map 2000, scale 1: 100000

**The study problem and its importance:-**

With the passage of time and the great development in the fields of map production, the data resulting from the classic model of land surveying (cadastral maps) became Which are very old paper maps produced in 1938 are insufficient in the context of economic development as the demand for more diverse elements of information becomes increasingly urgent and the data stored in traditional surveying systems does not meet the requirements associated with superior vision, management, decision-making, forecasting and development planning where it encounters several problems. Some of them do not contain any coordinate system, in addition to that they do not contain any modern features of the area and cannot be used for the purpose of dropping the borders.

When the UTM network system for these old paper maps was created by the General Survey Authority, one of the site’s corners was projected using a GPS device based on the coordinates taken from the network’s system of the General Survey Authority. To produce a modern map of the area and an accurate coordinate system to be adopted for the purpose of projecting the borders and then after that for design purposes.

Therefore, the importance of this study lies in preparing the ground or laying the foundation for the production of an abstraction map that contains all the land features, girders and terrain found in the area and with an accurate coordinate system for any area. By relying on accurate satellite images and corrected coordinates, which are the basis for the production of the modern map, it is also possible to link it to a digital altitude model to represent altitudes and levels.

**First / Definitions:-**

- 1-1- **The Map:** It is defined as a miniature model of the surface of the earth or part of it with a suitable scale with spatial and descriptive data for a specific time.
- 1-2- **Cadastral Map:** They are special maps for determining the ownership boundaries of the lands, whether those lands belong to individuals or the state, indicating the boundaries of the provinces, the pieces and their numbers, the index of the rivers, the right of course, watering, drinking, roads of all kinds, and the right of passage. Cadastral maps were drawn in the General Survey Authority for the period between 1934-1954 approximately according to different drawing scales 1: 2500, 1: 5000, 1: 1000, 1: 2000, 1: 50000. From those

- maps, maps of real estate sequences are produced
- 1-3- **Digital map:** Map produced using computer technology.
- 1-4- **Satellite or aerial photos:** They are images captured from satellites or aerial survey planes for selected areas and at a specific time, and taken with specific distinction accuracy or an appropriate photographic scale.
- 1-5- **Coordinate system:** X-axis and y-axis meet with a point of origin and are either in the form of geographic or quadratic systems and through which the data locations are determined according to the scale, The small scale is defined by the geographic system measured in degrees, minutes, and seconds (longitude and latitude), and the large scale is defined by the metric square system (east and north).
- 1-6- **Datum:** Sports model or oval shape regular to the surface of the earth and used to calculate the coordinates of points on the surface of the earth.
- 1-7- **Projection:** It is the transformation of the Earth's oval surface or any part of it into a two-dimensional surface using mathematical equations including the Mercator Global Transverse System (5).
- 1-8- **Zones:** There are 60 regions in the Mercator Global Browser system, Iraq is located within regions 39, 38, 37
- 1-9- **Hardwires:** Includes input devices (scanner, electronic stylus, etc.)
- 1-10- **Raster Data:** They are visual data such as satellite images or images of maps and charts, and the data is often prepared in the form of compact tapes, where these data are arranged by an electronic calculator system in the form of cells and these cells are called pixels, for example: The road that appears in the satellite image is represented by the specified number of pixels, and this number depends on the accuracy of the image recognition, and it is possible to feel this by performing enlargement operations for a specific viewer in the image until the magnification ratio reaches a high percentage in which the distortion of the road is noticed, The network data can be obtained by converting paper maps and paper images into a digital format using the scanner and dealing with them with a computer.
- 1-11- **Vector Data:** It is the data that is in the form of a point, a line, and an area, and this type of data is often obtained directly when it is drawn with computers and using certain programs and in general, This data can be obtained using numbering. Which represents the process of tracking a specific exhibitor present within an image shown on the calculator screen and drawing it and may draw the symptoms by electronic stylus, They may be topographic maps, land divisions, administrative boundaries, contour lines, road networks, cadastral control points, and maps for calculating uses and drawing, and the girders may be drawn using an electronic stylus. They may be topographic maps, land divisions, administrative boundaries, contour lines, road networks, cadastral control points, land use maps, and paper maps of the infrastructure. One of the most important vector data in geographic information technology, and there is also a new technique for showing point and linear surveying beams, which is The Global Positioning System GPS (6).
- 1-12- **Data:** Data consists of digital representation of specific types of data in a specific area of the Earth's surface with the aim of finding scientific solutions to specific problems in this spatial spot. . The data base for the "Geographical Information Systems" project is built for the first time, and then the UP date is constantly updated to reflect the reality on an ongoing basis. The database may be small in size (several megabytes) that can be stored easily on a hard disk and may be large in size (up to a terabyte). It is stored on a network server with large technical capabilities.
- 1-13- **The Programs:** The multiplicity of geographic information systems programs is one of the programs designed to work on the user's personal computer and other more complex programs that suit large organizations and are loaded on the organization's computer network server. Most of the "geographic information systems" programs are commercial

programs that are purchased from the companies that produce them, such as programs ArcGis, mapInfo, and Autocad map. Each program has technical capabilities that differ from one program to another, and there are several copies within the same program, each with different capabilities. (1).

1-14- **Geographical Information Systems (GIS):** It is considered a method or method for organizing geographical and non-geographical information by means of a computer and linking them to their geographical locations, depending on specific coordinates. Therefore, it is a method of linking geographical phenomena spread over the surface of the earth with a coordinate system and storing them in the computer memory and linking the metadata related to those phenomena through a database, analyzing it, showing it at a specific scale, and then printing it.

1-15- **Global Positioning System (GPS):** It is a global system used to obtain coordinates to determine the location of a particular point, recorded by a GPS device, It is a receiver that receives its reading from about 27 satellites orbiting around the earth (2).

1-16- **Definition of Cadastral:** The word in Latin origin is considered by some to be derived from "capitastrum", meaning regional record. Which was used by the Romans to tax collecting. The definition of the term Cadastral was and still is comprehensive and integrated, but its goals can be identified from its characteristics, advantages and methods of use.

❖ **Idiomatically:** Cadastral is a system for registering land ownership that clarifies the boundaries of those lands in their precise details, and it is also an organized inventory of general information related to real estate properties located within a country or region within that country, This inventory is based on a survey of the boundaries of these properties, and these properties are re-distinguished by using special names. The framework of these properties is shown with their names on

maps of large scales and appears associated with ownership.

#### **1-16-1 Cadastral has four advantages that complement each other:**

1. It is a systematic and structured process.
2. It is the evaluation and evaluation of the details of the various types of lands.
3. It is the process of surveying and mapping types of lands, as well as researching issues of ownership and other rights.
4. It is constantly renewed.

#### **1-16-2 Cadastral types:**

1. **Real estate Cadastral:** This system has been set up to register properties and real estate, whether they are residential lands or agricultural lands. Also, real estate registration is an official process whereby the rights related to real estate are registered through physical registration sheets or personal registration. . This means that there is an official record (real estate registry) that shows the rights and changes in the legal status of specific parts of the property.
2. **The property tax cadastral:** This system is mainly used to collect taxes and collect Al-Zakat.
3. **Cadastral is multi-purpose:** This type of Cadastral has become common among modern countries due to its many features, namely:-
  - A. Enables balanced taxation.
  - B. It has the ability to update the data bases.
  - C. Refers to the rural places and their development needs.
  - D. To manage forests.
  - E. Settlement of land disputes.
  - F. Mortgage application for banks.
  - G. Optimally managing municipal councils and sharing data among them.

#### **1-16-3 Features Cadastral Maps:**

1. Cadastral maps are characterized by being legal maps, and this means that the state sponsors, maintains, works according to them, and is approved officially and judicially.
2. According to the Cadastral maps, the land of Iraq was divided into large agricultural units, usually known as the provinces.



Each province has its name, surname, and serial number, and to which administrative unit it belongs.

3. According to the Cadastral map, the areas exploited within the same district were defined with their numbering according to the rules, and each plot has its own type, gender and rights.
4. Through the plot or province it is possible to know the private and public spaces.
5. Through the Cadastral Map, the majority of the terrain and its natural and artificial features are named in the map.
6. The symbols on the Cadastral Map are abstract signs of length, width, and quantity, excluding stroke length.
7. Any error in the cadastral map is corrected, and the deficiency is duly completed (3).

#### 1-16-4 Cadastral tasks:

1. Cadastral's job is to serve individuals and the state.
2. Cadastral contains a systematic inventory system for plots of land with regard to their size, shape and location, which are carried out by means of surveys.
3. The records contain a descriptive part in notebook form and an illustration in the form of a map in the other part.
4. Among its tasks is also enabling the owner of the land or whoever operates it to know its borders, so that he can deal in it. As well as finding the area that he intends to

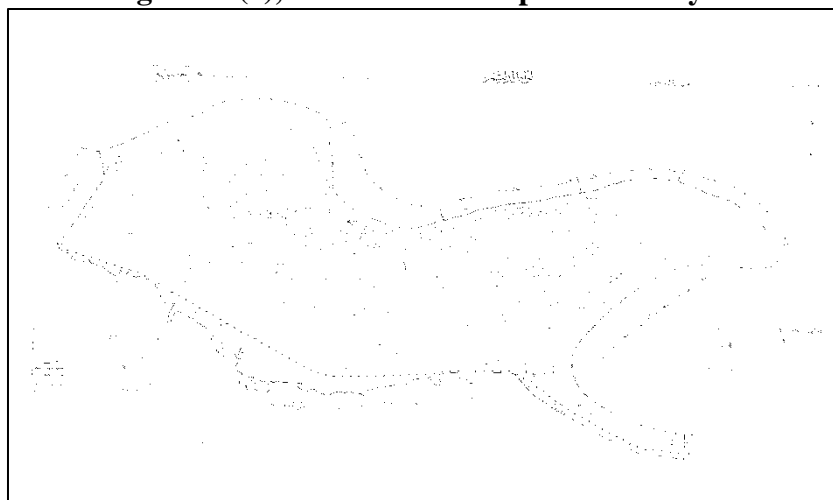
cultivate or the area allowed to be built near the borders of his lands.

5. For the purposes of registering title deeds, dimensional measurement is not necessary as long as the plot of land can be described and recognized by nature.
6. For tax collection purposes, approximate measurements of the area can be made. An accurate area is not necessary, even if the purpose is to estimate its value.
7. Accurate spaces are only conducted when they are specifically requested and the cost of them is paid from the request of citizens (4).

#### Second / updating the old paper maps and converting them into digital maps:

- 1-1- **Type of data collected:-** A digital aerial photo in addition to an abstraction map of the same area. The ground coordinates of some points in the study area were also monitored using a GPS device. And the cadastral map of the region, which was provided to us by the Real Estate Registration Department of the municipality of Habbaniyah district, and it is a very old paper map produced in the year 1938 AD, which contains the boundaries of the province. This map does not contain ground control points, just as most government agencies in the region rely on them, and they do not have any other modern map, as shown in Picture No. (2) below.

**Image No. (2), the cadastral map of the study area**

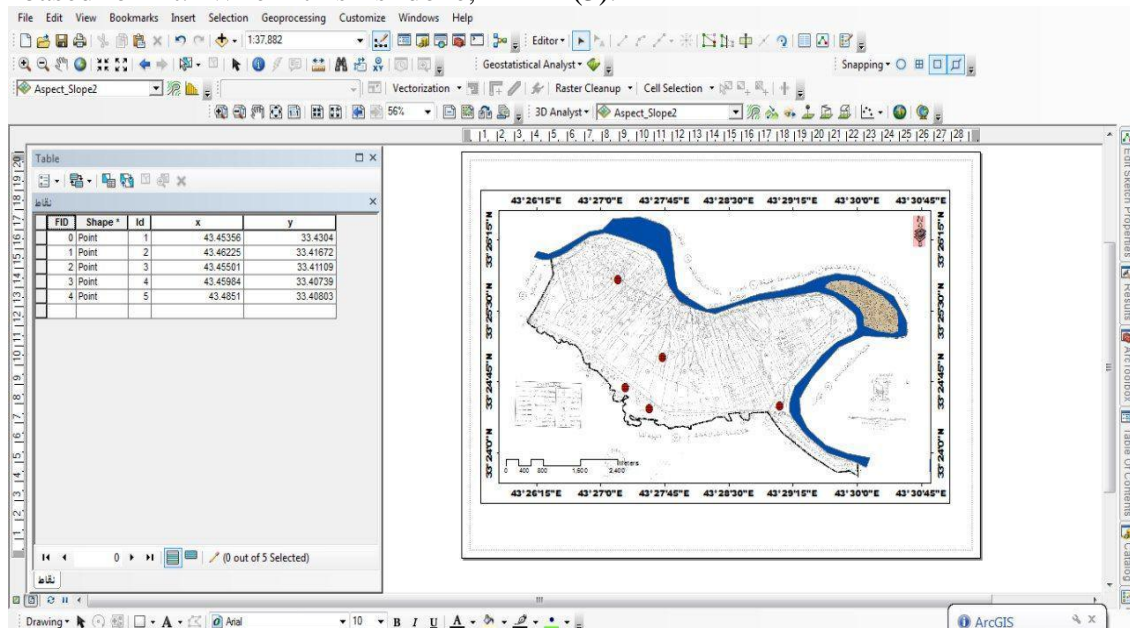


Therefore, this map must be updated and converted into a digital map so that we can project it and match it to the satellite image in order to show us the boundaries of the area on the image

so that we can then draw the girders that fall within the boundaries of the study area for the purpose of producing modern maps and for the purpose of updating this map, it must first be converted into an image in a format. Image, by

copying it using the scanner, then correcting its coordinates, linking it to a coordinate system, and then converting it to a digital map so that you can draw borders based on it. When this is done,

Rectify the image and store it in a file in the calculator, so we have a UTM corrected coordinate image. As in the Image shown below (3).



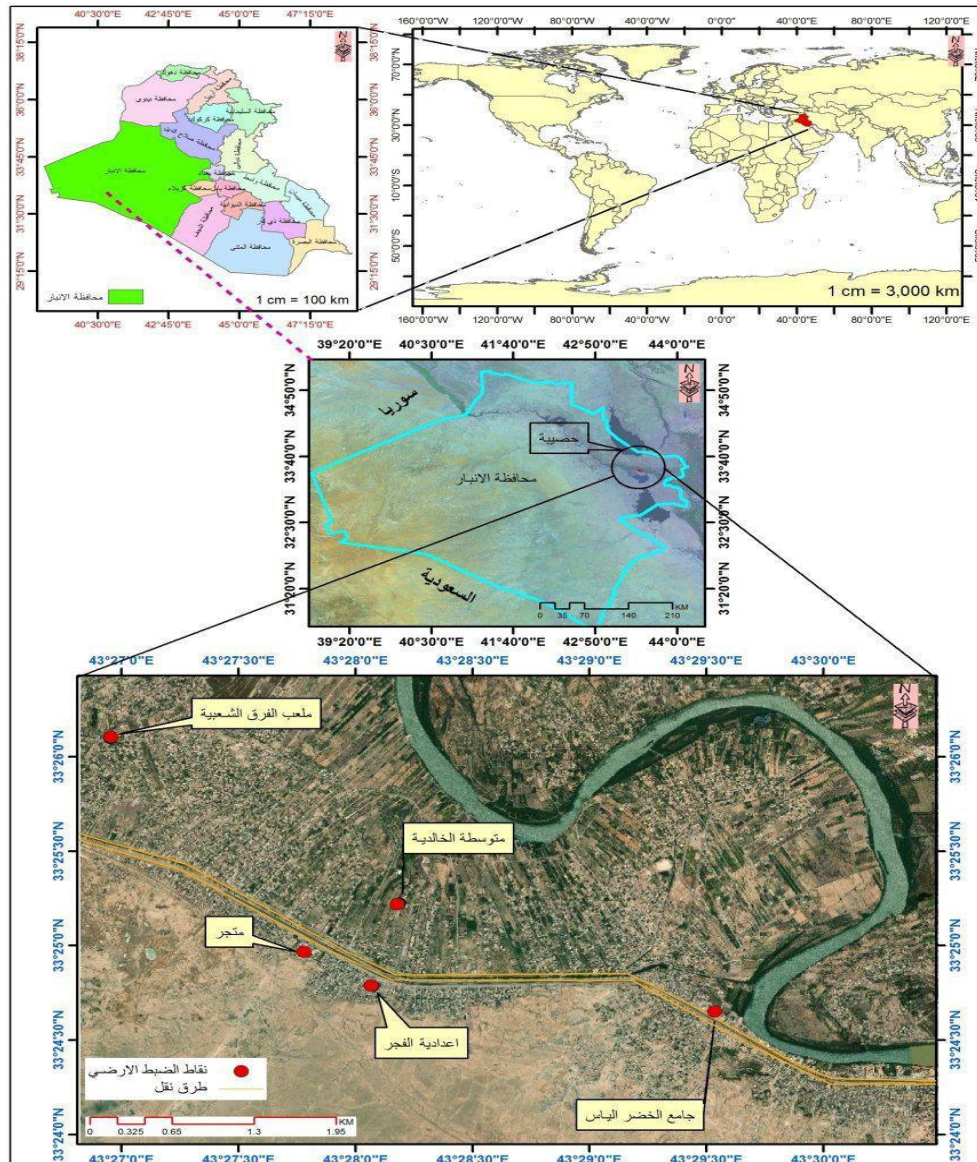
1-2- **Image adjustment process:** This type of adjustment is called engineering correction, by which the coordinates of the image are corrected and linked to a specific coordinate system and a specific geographical projection, and this is done by obtaining accurate real coordinates of some points in the image and then entering them into the program, Where the coordinates of some points in the study area were monitored on nature, and the use of a navigational GPS device in the monitoring process (7), then they were included in accordance with the "Arc gis" program, after that we open the "Arc map" from the "Arc gis" program and add the image of the study area To be set by the Add Data command, then we add the point

coordinates file that was previously saved on Excel with the commands.

File --- Add Data ---- Add X, Y Data ---- X Field = Field 1 --- Y Field = Field 2 --- Coordinate system = WGS 1984 UTM Zone 37 N

The point coordinates layer appeared in the form of points in their correct locations on the image and concluded that the image is accurate and linked to the UTM coordinate system, which is ready to be drawn over it with real dimensions and coordinates, and then we do the other step of the correction process, which is the Rectify process for the satellite image, where the program will build the corrected image from New and store them in the calculator file to be ready for drawing. (8).

Image No. (4) shows the location of the control points after dropping them on the image.



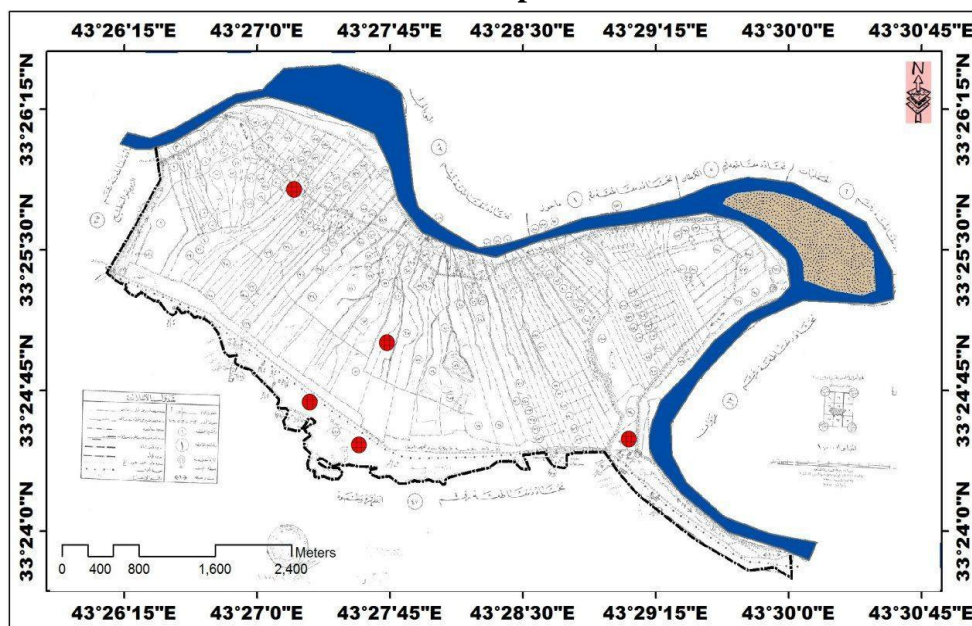
**Third / Converting the image into a digital map:**

The image is converted into a digital map by re-drawing it by the ARC map program, where a layer is created in the program of the type of polygon and its settings have been adjusted in the

UTM system and then activated the Editor tool in the program and we start drawing on this map in order to produce for us a digital with its real dimensions and correct coordinates depending on the map First. Picture No. (5).



**Image No. (5) illustrates the process of drawing the outer boundaries of the province based on the main map.**



**Fourth / Connecting the digital map to a DEM / Digital Elevation mode for the purpose of producing contour lines for the study area.**

Digital elevation model (DEM) / is a digital file that contains elevation data (relative) for a specific geographical area, which may be in linear form (vector)) (a group of lines each line consists of the X, y, z coordinates of a point or it may be in a Raster grid image. To represent the topography or topography of the land surface in a region.

There are many global digital elevation models SRTM, ASTER, ETOPO 2, GLOBE. The ASTER, SRTM models are among the most used

models around the world, especially in terms of spatial distinction ability (7). spatial resolution A digital elevation model SRTM, / shuttle radar topography mission was obtained for the study area using the GLOBAL mapper program, due to the ability of this program to import this data from the Internet in real time depending on the geographical coordinates surrounding the study area. After importing the digital elevation model for the study area, the contour lines were produced based on this model, and then the contour lines were exported to the GIS program in a special layer to be placed with the other layers of the digital map produced, Image No. (6) (7).



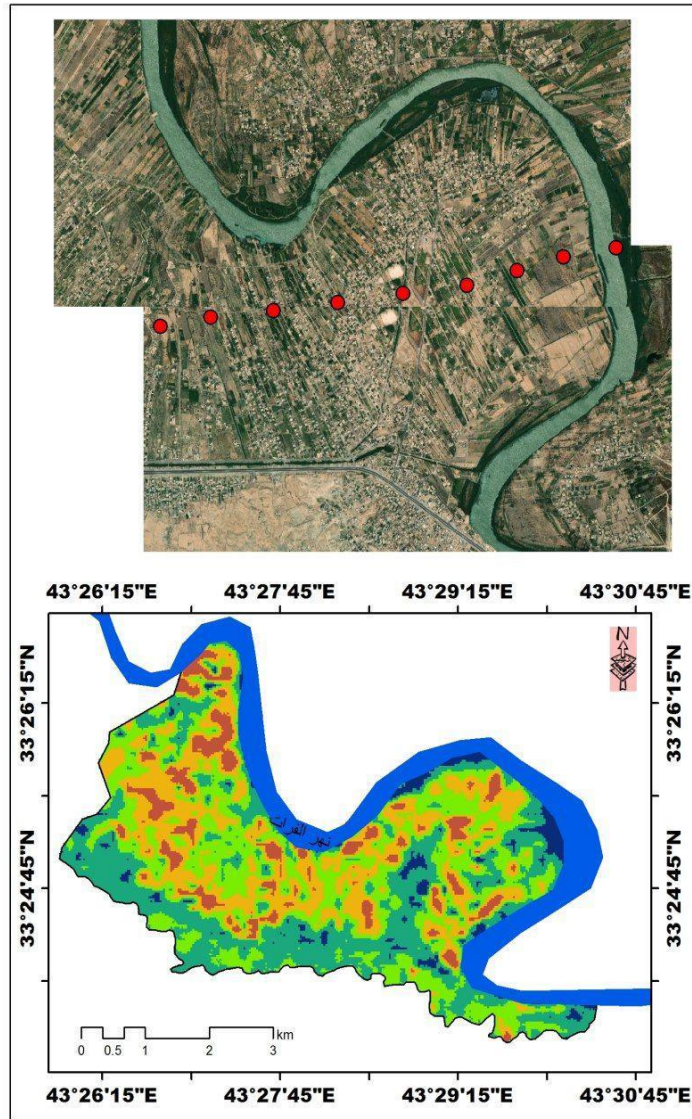
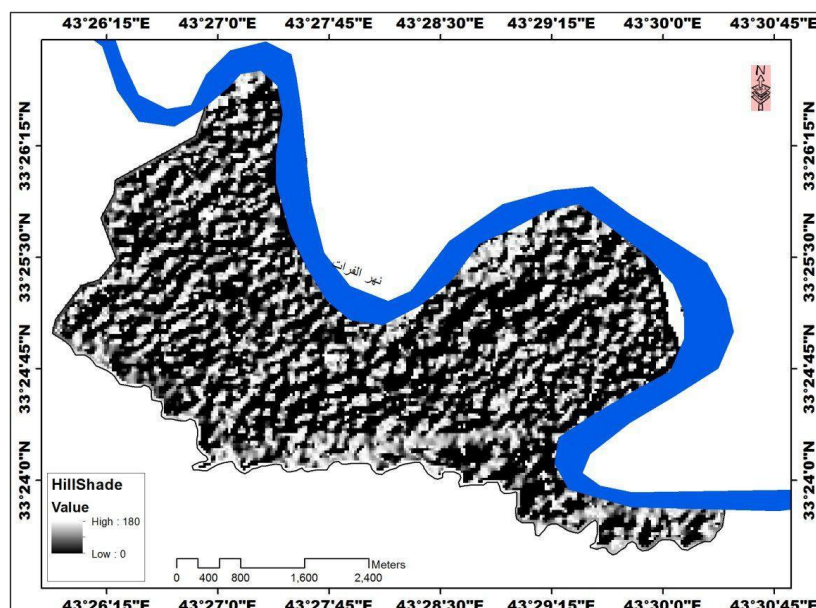


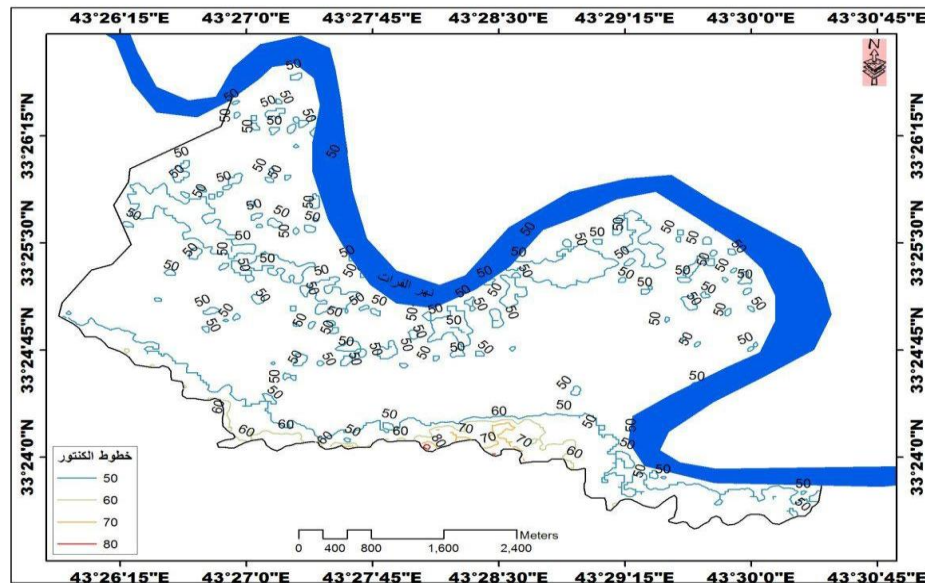
Image No. (7)



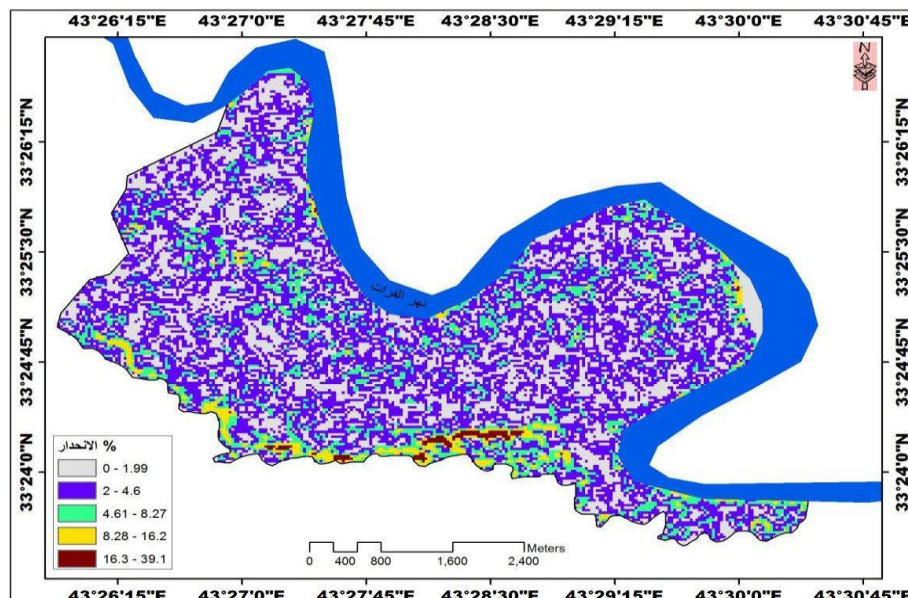
Upon completion of the previous steps, the satellite image is turned off, so that only the digital map required to be produced from these previous steps remains, to which we can add other information. In order to be an integrated map, such as adding to it the north direction and a quadratic grid with utm system, we can also add the map content (legend) in the GIS program, but for ease these layers are exported to the AutoCAD

civil 3d land desktop program for its high ability to deal with maps, colors and additions, and the following images illustrate a model The digital elevation of the study area.

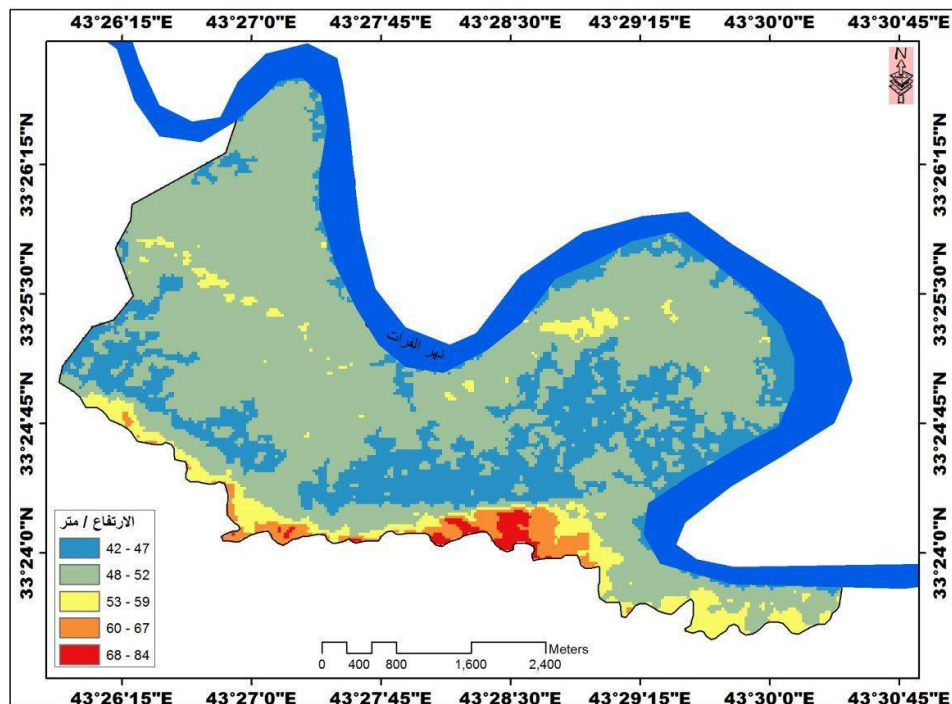
**image No. (8) represents the contour lines for the study area**



**image No. (9) represents the slope level of the study area**



**image No. (10) represents the level of height above sea level in meters.**



**Conclusions and recommendations:**

1. The importance of geographic information systems in shortening the path for researchers in time and effort instead of going over and over to the study area, As these software gives accurate coordinates to the geographical location, and the ability to display and extract information from the information base in the way the researcher wants, and the information becomes real, credible and comprehensive, enabling the researcher to give him a general and specialized view of the area.
2. It provides high-resolution satellite images for correcting paper maps.
3. The huge potential in software use of digital technologies to build spatial and descriptive databases and correct paper maps.
4. Old paper maps have been converted into modern digital maps with UTM WGS84 instead of the old Clarke 1881 system.
5. Ground control points have been installed at the site using a GPS device that can be adopted for the purpose of conducting surveys and audits in the area.
6. The search method can be used to update any metadata map for any region of Iraq and link it to a private database.

In order to maximize the benefit from modern maps, many obstacles that hinder the expansion of the circle of modernizing these maps on a large

scale in the regions of Iraq must be overcome through the following recommendations: -

1. Inclusion of updating cadastral maps within a specific time plan as a national project - due to the overlapping information and data they contain and their multiple dependencies, in which the efforts of the concerned bodies are combined. With the efforts of the General Authority for Survey and Real Estate Registry and real estate registry offices in order to produce modern maps that are accurate in terms of surveying and supported by legal documents of ownership.
2. Activating the role of universities, institutes and research centers, by making the process of updating the cadastral maps a research project at the regional level for each university and the competent government agencies in each region cooperate in it to provide all the necessary scientific and technical information and assistance, provided that the updating processes are carried out under the supervision of the geography and survey departments of universities in each region in cooperation with The space to overcome one of the cost hurdles of modernization and ensure their accuracy.
3. Spreading the culture of digital technologies, theoretically and practically, in all direct service departments.



4. Qualifying the technical personnel specialized in how to convert old paper maps (cadastral) to the digital format assigned to the real coordinate system.

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