PROJECT REPORT

ON

TOPOGRAPHICAL INFORMATION SYSTEM OF PART OF JUDGES QUARTERS, TANKE, ILORIN SOUTH LOCAL GOVERNMENT AREA, ILORIN KWARA STATE

BY

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HND/23/SGI/FT/033

PROJECT SUBMITTED TO THE DEPARTMENT OF SURVEYING AND GEO-INFORMATICSINSTITUTE OF ENVIRONMENTAL STUDIES

IN PARTIAL FUFILMENT OF THE REQUIRMENT FOR THEAWARD OF HIGHER NATIONAL DIPLOMA (HND) IN SURVEYING AND GEO-INFORMATICS

JUNE, 2025

CERTIFICATE

I hereby certified that all the information given in this project were obtained as aresult of observations and measurements made by me and that the survey was carried out in Accordance with Survey Rules, Regulations and Departmental instructions.

SIGNATURE OF STUDENT: ……………………………………

NAME OF STUDENT: ADENIYI AISHAT ADERAYO

DATE OF COMPLETION: ……………………………………….

CERTIFICATION

This is to certify that **ADENIYI AISHAT ADERAYO** with Matric No. **HND/21/SGI/FT/033** have satisfactorily carried out the survey duties contained in this project report under our direct supervision.

I hereby declare that he has conducted himself with due diligence, honesty andsobriety on the project.

……………………………… **…………………………….**

SURV. A.O AKINYEDE **DATE**

PROJECT SUPERVISOR

…………………………….. **………………………**

SURV. R.S. AWOLEYE **DATE**

PROJECT CO-ORDINATOR

…………………………….. **…………………………….**

SURV. A.I ISAU **DATE**

HEAD OF DEPARTMENT

…………………………….. **…………………………….**

EXTERNAL SUPERVISOR **DATE**

DEDICATION

This project is dedicated to Almighty Allah and my lovely parent

ACKNOWLEDGEMENT

All thanks to Almighty Allah the creator of my life for his guidance, protection and his Mercies on me for the completion of my project.

My sincere gratitude goes to my Supervisor; SURV. ADEBANJI AKINYEDE for being my support right from the beginning of this project and my Head of Department (HOD); A.I ISAU for all his support academically, morally, I really appreciate you sir.

I want to thank my lecturers right from Surv. Ayuba Abdulsalam, Surv. R.S Awoleye, Surv. Asonibare R.O, Surv. A.G Aremu, Surv. B.F Diran, Surv. Williams kazeem and Surv. Kabir Babatunde for their supports, Mentorship and guidance on the completion of my project, They are awesome in so many ways which I couldn't believe, I pray for that may the grace and favour of Almighty Allah be with them and their entire family Amen.

I also want to thank all teaching and non-teaching lecturers of surveying and Geo informatics department for their support on us one way or the other and the knowledge they impacted in us, may the blessings of Almighty Allah be with them too Amin. I also thank my Parent Mr. and Mrs. Adeniyi and the entire family members for accepting me and for their support and love shown to me since my day one in Kwara State Polytechnic Ilorin may they keep on glowing in peace and love Amin.

A big appreciation to my parents Mr and Mrs Adeniyi for their guidance, support and courage on me, may the blessings of almighty Allah be with them throughout their time on earth, may they live long to reap the fruit of their labor on me Insha Allah Amin. Also my siblings I really appreciate their efforts and supports on me may Almighty Allah grant them their heart desires and answer their prayers Insha Allah Amin.

I'm also grateful to my friends, for their camaraderie, motivation, and help whenever I needed it. Their collective support has made this journey more enjoyable and fulfilling.

I also thank my family members for the love and support in one way or the other may Almighty Allah answer their prayers Insha Allah Amin. In conclusion I send my faithful appreciation to my co-mates may the blessings of Almighty Allah be with everyone Insha Allah Amin, and others names unmentioned I'm using this medium to explore my grateful heart and a big thanks to everyone.

ABSTRACT

This project is development of topographic information system of part of Judges Quarter, Tanke, Ilorin South Local Government, Ilorin, Kwara State., using Total station. It was observed that the study area, has an updated topographic plans and maps showing the relief of the estate premises. Therefore, this project would provide a relevant data of the topography of the estate. This project was therefore carried out with the aim of producing a tools for effective planning and proper environmental management. Field and office reconnaissance survey were carried outin order to be familiar with the nature of the terrain and plan the methodology and equipmentto be used for the acquisition and assembling of spatial and attribute data. Total station and its accessories was used in the acquisition of Geometric and Attribute data. The data processing were adequately and effectively done with the use of AUTOCAD2007, SURFER9, ARCGIS, Microsoft excel, note pad, and Microsoft Word software. using the data processing as the management phase, a spatial database was modeled and structured using the relational table format. The usefulness of the topographic information generated was highlighted and map revealed the true configuration of study site and vacant areas for future development. A digital terrain model was created to enhance further analysis on slope, aspect, contour, flow direction and flow accumulation analysis of the study site. The information is also available for querry that will assist in the physical planning of the area under investigation. The study concluded that topographic information system is essential for physical and accurate decision making. The system allows easy updating of information and quick retrieval of information for better planning and environmental management.

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CHAPTER ONE

1.0 INTRODUCTION

1.1 BACKGROUND TO THE STUDY

Land surveying is the first point of reference in all meaningful land development projects. Provision of infrastructures; planning of towns and cities; management of hazardous natural events and human actions such as erosion, flooding, earthquakes, and subsidence; coastal management; exploration and exploitation of minerals; sitting of industries; resources exploitation on the land and on the sea all are dependent on Land Surveying products.

The demand for topographic information for various needs and applications by numerous users is on the increase. From a global point of view, there is no meaningful development embarked upon by an individual, government and agencies without information about the topography of the area to be developed. In recent past, classical and conventional techniques were used to produce topographical maps, whereas the configuration of the terrain can be shown in form of contour lines (Jimoh, 2014).

Topography is generally known as the study of earth surface, and its features and shape. It also gives the description of the features (such as surface, shapes, vegetation cover & elevations), depicted in maps. In essence, topography mainly concerned with local details such as vegetative and man-made features including local history and culture. More specifically, topographic surveying involves the gathering information on terrain, three dimensional details of the surface including recognizing the specific land forms. In modern terms, it is the generation of data digitally or electronically. The outcome of topographic survey is the graphic representation of a given land parcel on a map using several techniques such as contour lines, Hypsometric tints and relief shading (i.e. topographic maps). There are varieties of methods used in topographic surveying. For example, direct surveying, remote sensing, aerial and satellite imagery, photogrammetry, radar and sonar.

Topography of an area describes the surface characteristics of relief features of such area as depicted by hills, valleys and plains. It can be used to study and represent, as a surface, any characteristic that has a continuously changing value other than elevation. For instance, population, geo-magnetic data and geochemical data.

Topographical Surveying involves the acquisition of topographic data of the features on the earth's surface, both man-made and natural in three dimensions. This employs the techniques of plane surveying and other special techniques to establish both horizontal and vertical controls.

The implications of the above is that no meaningful development can be embarked upon by an individual, government and any other agencies without information about the topography of the land in the area where such development is to take place. Topographic Information System can be derived from the topographical data with the employment of the analytical capabilities of Geographic Information System (GIS).

According to Burrough (1986), GIS is a tool for collecting, storing, retrieving at will, transforming and displaying spatial data from the real world for a particular set of purposes. In short, GIS can be used to add value to spatial data (Sharma et al 2006). This is by allowing data to be organized and viewed effectively, by integrating them with other data, by analysis and by the creation of new data that can be operated on in turn to create useful information that can help decision making.

The uniqueness of GIS is in its ability to integrate data from a variety of sources. A GIS can thus be described as a form of spatial decision support system. This objective of this paper is to create topographic information system for adequate management immediate physical environment.

Digital technology was successfully introduced in the field of mapping in the late 1960"s as means of speeding up map production. (Perera and Shanta, 2002). With the change in technology in the last two decades and the growth in the number of spatial information systems, the concept of topographic database has been introduced in several mapping-surveying organizations in the world, in order to deliver more Geo-information to the user community.

Topographic Information System is very crucial in this present age in other to be able to update maps and retrieve necessary data at any given time with minimal efforts. Topographic Information System can be explained as the combination of human effort and computer-based tools for the collection, storage, analysis, manipulation and retrieval of various kinds of data relating to geographic features (man-made and natural) on the surface of the earth (Lexicon Universal Encyclopedia , 1989).

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1.2 STATEMENT OF PROBLEM

Topographic information system is very essential for areas where any physical developments are to be carried out. Such information like location, size, nature and terrain features of the area required. The existing topographical map showing the position of featuresof the area (Part of Judges Quarters, Tanke, Ilorin) failed to meet the users need in terms of decision making and in development planning. Therefore, this project will serve as the digital base plan and spatial database that can be used in planning and also in the retrieval of information for the purpose of decision making.

1.3.0 AIM AND OBJECTIVES OF THE STUDY

1.3.0 AIM

The aim of this project was to create a Topographic Information System (of both natural and man-made features) Part of Judges Quarters, Tanke, Ilorin South Local Government, Ilorin, Kwara State.

1.3.1 OBJECTIVES

In order to achieve the aim of this project, the following objectives were considered:

i. Designing a suitable topographic database of the project area;

ii. Carrying out planning which include office planning and Field Planning
iii. Data Acquisition using ground based method.
iv. Creation of database about the attribute and Geometric data;
v. Performing relevant spatial Queries like Overlay Analysis, Buffering, Classification and Retrieval;

1.4 SIGNIFICANCE OF THE STUDY

In a sustainable development environment that will meet the need of the present without compromising the ability of the generation to meet their own needs, there must be an up to date information system that will aid in good planning, decision making and managements. Hence, the creation of a Topographic Information System of Part of Judges Quarters, Tanke, Ilorin South Local Government, Ilorin, Kwara State. This will provide the user of the area and meet the need to plan with accurate data. This will help in planning for controlling natural phenomena such as erosion and also for the planning of infrastructural facilities. Applications and benefits of topographic information system which make it a useful tool in problem solving environment includes;

vi. It provides quick and easy access to large volumes of data.
vii. These provides the means to update map and data quickly.
viii. It provide new and flexible form of output such as customized maps (that is, map tailored to meet users specific needs) in classical and digital form.
ix. It has the ability to select terrain from the database by area or theme.
x. It gives room to search for particular characteristics of features in an area.
xi. It provides means for analyzing the spatial characteristics of data.
xii. It allows the experimentation with different geographical representation of the same data.
xiii. It provides answers to complex land related questions.

xiv. Topographical information system has the ability to merge one data set with another (e.g geometric data and attribute data). Generalization and statistical analysis can be performed.

xv. It facilitates efficient information retrieval.

xvi. Aid in environmental impact assessment.

1.5 SCOPE OF THE PROJECT

The scope of the project involves the design and creation of a spatial database, the use of automated surveying equipment for data acquisition, processing of field data with the aid of computer hardware and software, query generation for the topographic database, representation of the information in digital form both softcopy and hardcopy and the compilation of a comprehensive report.

1.6 PERSONNEL

TABLE 1.1:- Personnel

1	ADENIYI AISHAT ADERAYO	AUTHOR
2	IYANDA PHILIP AYOMIDE	
3	BELLO IBRAHIM OPEYEMI	
4	OLABOSOYE GIFT FUNMILAYO	
5	UTHMAN BADIRAT BUKOLA	
6	EMMANUEL MERCY UNEKWUOJO	

1.7 STUDY AREA

The study area falls within Part of Judges Quarters, Tanke, Ilorin South Local Government, Ilorin, Kwara State. The study area falls on latitude 58°15'26"N and longitude 2°44'41"E. The area of the project site was found to be 5 hectares. The project area is a developed area with features like buildings, roads, trees, electricity lines, street lights, and masts e.t.c.

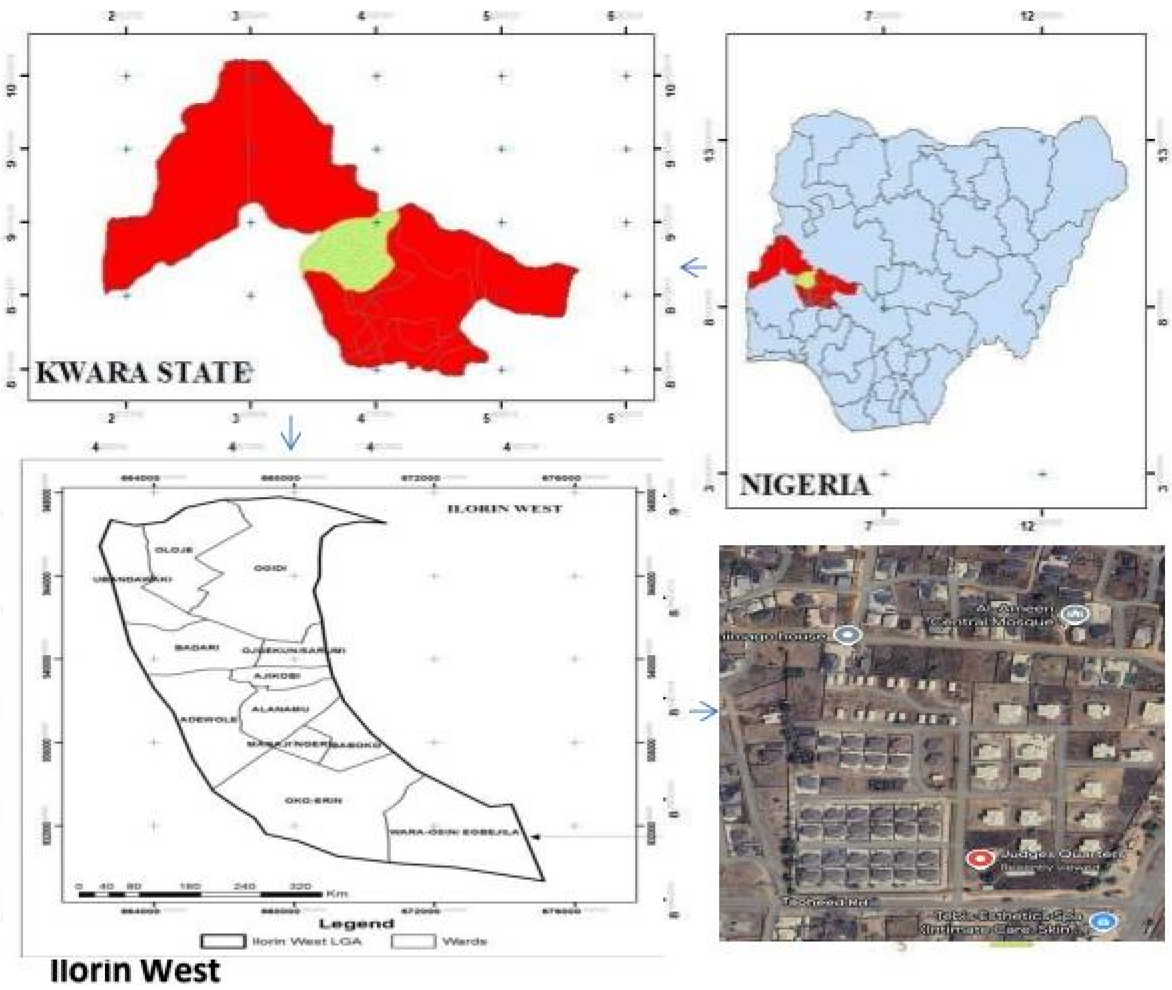


Fig 1.1 Diagram of the study area.

CHAPTER TWO

2.0 LITERATURE REVIEW

The demand for Topographic Information System for various needs and applications by numerous users is on the increase. There is no meaningful development embarked upon by individual, government and other agencies without information about the topography of the land to be developed. In the past, classical techniques were used to produce the topographical maps and where the configuration of the terrain can be shown in form of contour lines. As at today, GIS has been developed from the need to overlay attribute information about land with its cartographic representation in order to perform spatial analysis.

MacMillan Dictionary of Data Communication (1985) define data as a general term loosely used to denote any or all facts, numbers, letters, symbols which can be processed or proceeded by a computer. Downling (2000) also defined data as an individual fact about something or somebody that has not been organized (raw data) e.g. a random collection of names and telephone numbers while Nick (2000) defined data as that which has been organized in such a way as to be useful for somebody. Information was defined as a processed data which has been refined into a form that is meaningful to their recipient and it is the knowledge contained in a message and has a perceived value in current or prospective decision making.

Ndukwe (2001) defined information as a data element of some kind which is useful for a particular application such as decision making process even though information and data technically have been interchangeably used but there is slight distinction between the two words. The procedure undergone by a data to become information is termed processing. There are ways in which data can be processed and include;

i. Sorting: the data can be recorded so that it is easier to find or compute data items.

ii. Searching: an individual data can be finding from hundreds, thousands or even millions of other data items.

iii. Filtering: a smaller set of data item can be selected so that it is easier to find the required information.

iv. Aggregation: items can be grouped, added together, counted and to produce a summary of the data.

v. Performing additional calculation: new values can be calculated from the data item that exists. According to Dowling (2000), the characteristics of useful information are as follows;

- It should be up to date (current inventories).
- It should be complete and relevant.
- It should be consistent.
- It should be accessed by authorized personnel.
- It should be preprinted in usable form.
- It should be secured against unauthorized access (personnel).
- It should be on time so as to meet the dead line time of users.

It was observed in the whole world that information and communication technologies are generating a new industrial revolution already as significant and far-reaching as those in the past. This revolution has brought about capabilities of human intelligence and consequently changed the way work are done and how we live together.

Geographic Information System (GIS) evolved as a new technology in surveying. It combines geographic data (location) and attribute data about object feature on the earth„s surface with cartographic representation in order to perform spatial decision making using spatial analysis. According to Burrough (2006), GIS is a tool for collecting, storing, retrieving at will, transforming and displaying spatial data from the real world for a particularset of purposes. In short, GIS can be used to add value to spatial data (Sharma E. O., 2006). This is by allowing data to be organized and viewed effectively, by integrating them with other data, by analysis and by the creation of new data that can be operated on in turn to create useful information that can help decision making. GIS is unique in its ability to integrate data from variety of sources. A GIS can thus be described as a form of spatial decision support system. A digital terrain model (DTM) is a topographic model of the terrain relief that can be manipulated by computer programs (Ndukwe, 2001). The data files contain the spatial elevation of the terrain in digital format which are usually represented as a rectangular grid. Vegetation, buildings and other man made (artificial) features are removed leaving only the underlying terrain. Modeling terrain relief using DTM is a powerful tool in GIS analysis and visualization. DTM can be stored in GIS database in several ways: - As a set of contour vectors, a rectangular grid of equal spaced corner/point height or an irregularly spaced set of point connected in triangles (TIN-Triangular Irregular Network)

Topographic Survey

Topography is generally known as the study of earth surface, and its features and shape. It also gives the description of the features (such as surface, shapes, vegetation cover & elevations),depicted in maps (Ojiako, 2017). These characteristics are natural and artificial (or manmade). Man-made features are highways, bridges, dams, wharfs, buildings, and so forth.

A topographic survey is a survey conducted to obtain the data needed for the preparation of a topographic map. This data consists of the horizontal and vertical locationsof the features to be shown on the map. Topographic Surveys are surveys made to determine the configuration of the earth"s surface and to locate natural and cultural features on it.

Topographic surveys establish the different man made and the natural features of land. This type of survey can be very beneficial to home owners, industrial owners, or even for properties under construction. Land may include hills, trees, fences, buildings, ravines. A topographical survey will provide exact figures of the size, height and position of different changes that have occurred over the course of time with regard to their presence or that ofany man made structures. A graphic representation of the topography of this area is called a topographic map. A topographic map is simply a drawing that shows the natural and artificial features of an area. Topographic maps with larger scales as well as digital map products are necessary for better planning (Charles, 2012).

This report comprises the few of the activities involved in topographic map compilation such as field data acquisition, processing of field data, analyses of data and presentation of results and elevation models of acquired topographic field data using AutoCAD Civil 3D, Surfer 10 and ArcGIS 10.3.

Topographic Information System

Digital technology was successfully introduced in the field of mapping in the late 1960‟s as means of speeding up map production (Perera, 2002). With the change in technology in the last two decades and the growth in the number of spatial information systems, the concept of topographic database has been introduced in several mapping-surveying organizations in the world, in order to deliver more Geo-information to the user community. Topographic Information System is very crucial in this present age in other to be able to update maps and retrieve necessary data at any given time with minimal efforts. Topographic Information System can be explained as the combination of human effort and computer-based tools for the collection, storage, analysis, manipulation and retrieval of various kinds of data relating to geographic features (man-made and natural) on the surface of the earth (Lexicon Universal Encyclopedia, 1989).

In view of this, it is necessary to create Topographic Information System for different locations because the information generated from such system can be used for various purposes in physical planning and decision making in such locations. Some of the usefulness and advantages of this digital database for such system over the conventional maps include: -

a) Possibility of fast amendment and dynamic updating of data b) Fast capturing of data with Total Stations or GPS c) Analysis of many important spatial problems d) Versatility in integrating data collected from various sources e) Flexibility output possibilities f) Provides bases for additional information with relative ease for production of maps.

Topographic Information and Geographic Information Systems (GIS)

Topographic detailing and Geographic Information Systems (GIS) are a sine-qua-non for the successful creation of any Topographic Information System. A TIS would be best described as an incorporation of human efforts, Information and Communication Technology ICT using computerized tools and relevant software for the collection, storage, analysis, manipulation and retrieval of various kinds of earth related data (natural and artificial). The demand for Geo-Information about topographic features of the landscape has been increasing continuously. Its ranges of application are for the planning of power supply, transportation, construction among others. Topographic data are vital for many scientific, technical, and other applications. Even when not used directly in a study, topographic data are often used in preparing visualization tools such as perspective or stereoscopic views of terrain (NOAA, 2017). Topographic information system can be derived from the topographic data with the employment of the analytical capabilities of GIS (Onuigbo, Zita, Gbedu, Pious, & Samaila, 2015). The modern digital techniques for the compilation of topographic maps greatly differ from the conventional processes. Today, the collection of topographical data by modern digital tools is carried with the view of building a complex topographic multi-purpose system.Thus, the focus of topographic surveying has shifted from production of analogue topographic maps printed on paper to the structuring, production, capture and maintenance of an organized and regulated database of digital spatial information (Igor, 2010).

The acronym GIS sometimes used for Geographic Information Science is used torefer to the academic discipline that studies Geographic Information Systems and is a large domain within the broader academic discipline of Geo-informatics. Geographic Information System (GIS) evolved as a new technology in surveying. It combines geographic data (location) and attribute data about object feature on the earth„s surface with cartographic representation in order to perform spatial decision making using spatial analysis (Odo, Idhoko, Oha, Okoro, & Okafor, 2015).GIS is becoming essential to understanding what is happening and what will happen in geographic space. Once we understand, we can prescribe action. This new approach to management-managing geographically-is transforming the way organizations operate.

A GIS is a computer-based system that provides the following four sets of capabilitiesto handle geo-referenced data (Otto & Rolf, 2009):

i. Data capture and preparation.
ii. Data management, including storage and maintenance. Data manipulation and analysis.
iii. Data presentation.

A geographic information system (GIS) lets us visualize, question, analyze, and interpret data to understand relationships, patterns, and trends. “GIS is an integrated system of computer hardware, software, and trained personnel linking topographic, demographic, utility, facility, image and other resource data that is geographically referenced. “National Aeronautics and Space Administration (NASA)”.

Salimon O., (2015); approached Topographical Information System of Durbar Grammar School, Oyo East Local Government Area, Oyo State. The processes involved in the execution of the project include: spatial data acquisition, designing and creation of the database, data downloading, data processing, etc. spatial data were acquired using SOUTH (S/No:S16126) Total Station, while attribute data were acquired through social surveys. All the techniques involved were explicitly itemized and discussed. Spatial analysis and product generation were carried out. Plotting was done using AutoCAD 2007 Land Development, Surfer 10 was used in generating the contour. Database design and creation were carried out using ArcGIS 10.1 software. The topographic database was tested by running queries and subsequently the required information necessary for decision making were generated.

Also, Bayewumi S., (2009); approached his Topographical Surveying for Awe High School, Awe, Oyo State. Using an analogue approach of spatial data acquisition using analogue Theodolite, automatic leveling instrument, processing of data acquired manually using programmable calculator and presentation of the product in analogue map. The final product of his plan shows the perimeter boundary, features and contour plan of the area. Limitation using this approach is that the form of data acquisition is time consuming and the product is rigid and all information are kept in analogue form and could not be easily updatedand converted to digital spatial database.

Furthermore, Odo P. A.; approached the Topographic Information System of part of Delta State Polytechnic Ogwashi-uku, Aniocha South, Delta State, using digital methods of data acquisition and data processing. Total Station (KOLIDA K46346) was used to acquire spatial data (X, Y, Z Coordinates) within the study area through the process of traversing, leveling and detailing, which were simultaneously carried out. The data processing was adequately and effectively done with the use of AutoCAD 2013, ArcGIS 10.1 and Surfer 9.0 software using the data processing as the management phase, a spatial database was modeled and structured using the relational table format. A digital terrain model (DTM) was created to enhance further analysis on slope, aspect, hill shade and view shed analysis of the study site. Limitation to his product is that only part of the study area was sampled and information about the neighboring environment was not included in his approach.

Another study by Ojiako J.C. and Jimoh S. O. (2017) on Topographic Information System (TIS) of Federal School of Surveying, Oyo East Local Government Oyo State Nigeria carried out TIS with the aim of producing a tool for effective planning and land management of the school. Field and Office reconnaissance were carried out in order to be familiar with the terrain and do proper planning on the methodology and equipment to be used for the acquisition and assembling of spatial and attribute data. The geometric (spatial) data were acquired by ground survey method using Total station (South S74301) through the process of traversing, detailing and obtaining spot heights which were carried out simultaneously. The data processing was adequately and effectively done using Leica Geo Office Tools and South NTS Software for Data downloading, Notepad and Microsoft Excel for editing and preprocessing, AutoCAD 2016 for draughting, Surfer 11 for generating the Digital Terrain Model (DTM) and 3D Wireframe Map while ArcGIS 10.0 version was used for spatial analysis, query generation and information presentation. A model database was created and structured using the relational table format.

Finally, a study by Adewara M. B. and Kolawole O.A. on Topographic Information System (TIS): A Tool for Effective Planning and Proper Environmental

Management (A part of The Federal Polytechnic, Ilaro, Nigeria). In their study, Landsat 8 (2010) image of the project site was used during the planning stage to have a general overview of the project site. Field data were collected using Total station instrument and processed using the Microsoft excel spreadsheet then saved into notepad to be called up in AutoCAD Civil 3D 2013 for scripting and generation a surface contour. Topographic information (TI) was created in the computer based on the collected datasets. Digital Terrain Model was created for further enhancement of the slope map, aspect map, hill shade and view shed analysis of the area using ArcGIS 10.2 and Surfer 10 software. The TI is available for manipulations and querying. The study concludes that TIS is essential for physical planning and accuratedecision making as it is a system that allows easy updating of information and quick retrieval of information for better planning and environmental management.

CHAPTER THREE

3.0 METHODOLOGY

This phase outlines the methods and procedures employed in the planning, data acquisition, data processing, and development of both the database and the database management system, as well as the presentation of information. These activities were systematically organized and executed in sequential stages, including the design of the database. The process typically involves a spatially referenced, structured digital database, along with suitable application software for geospatial analysis. It essentially highlights the techniques and principles applied throughout the project. Geographic Information System (GIS) methodologies were utilized to achieve the intended outcomes.

3.1 DATABASE DESIGN

The design of any database involves three stages namely;

i. Conceptual design
ii. Logical design
iii. Physical design

3.1.1 VIEW OF REALITY

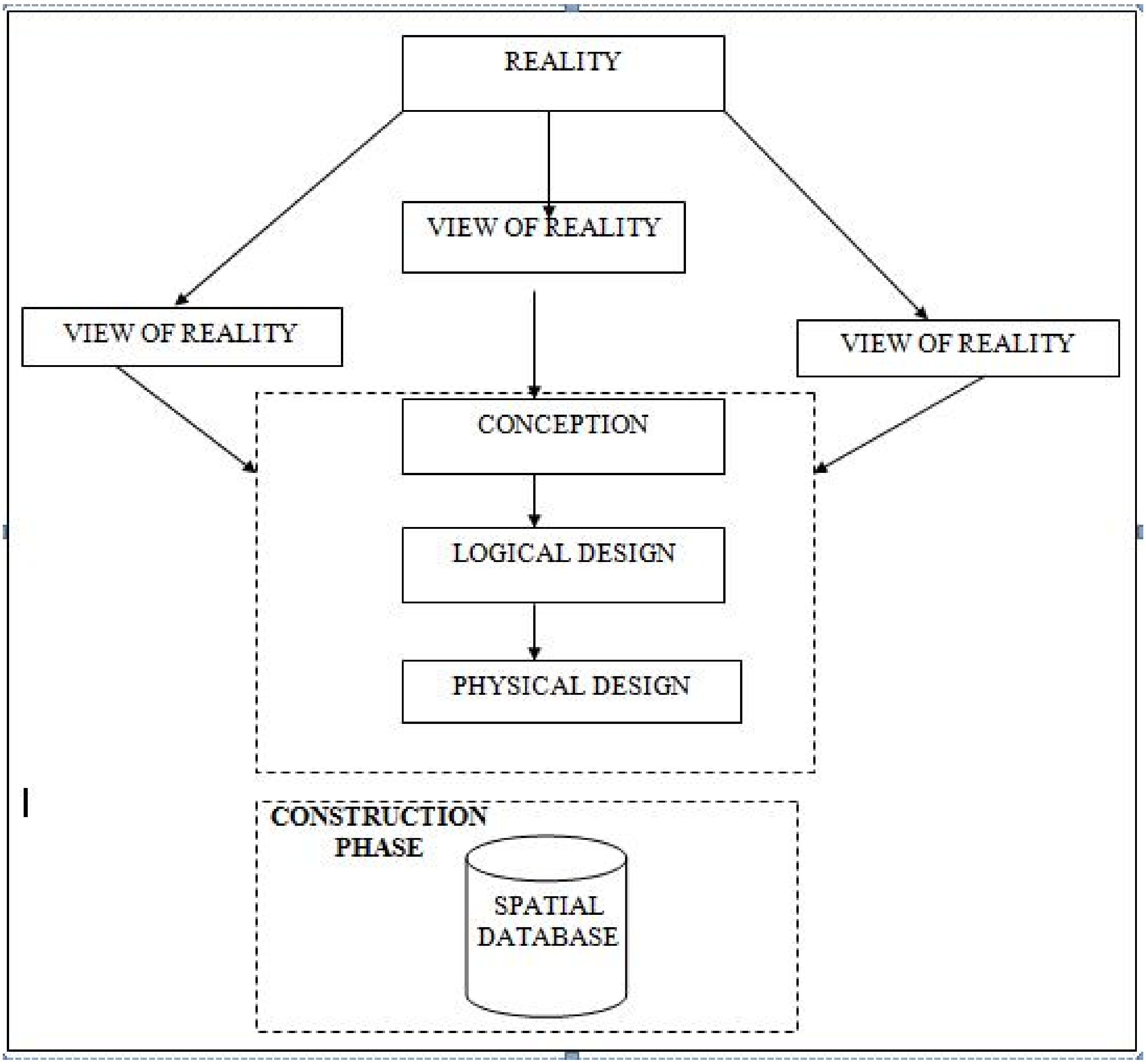
In database design, it is essential to consider *reality*, which refers to the actual physical phenomena that exist encompassing all elements, whether or not they are perceived by individuals. A *view of reality*, however, is a mental abstraction tailored for a specific application or set of applications.

For this project, the view of reality is based on the topographical features of the study area. Since it is not feasible to replicate the real world exactly, the approach involves conceptualizing and modeling the real-world environment in a structured way to allow for accurate representation and analysis.

The key features of interest in this project include:

- Roads
- Electric Poles
- Trees
- Building

Fig. 3.1 Design and Construction Phases in Spatial Database

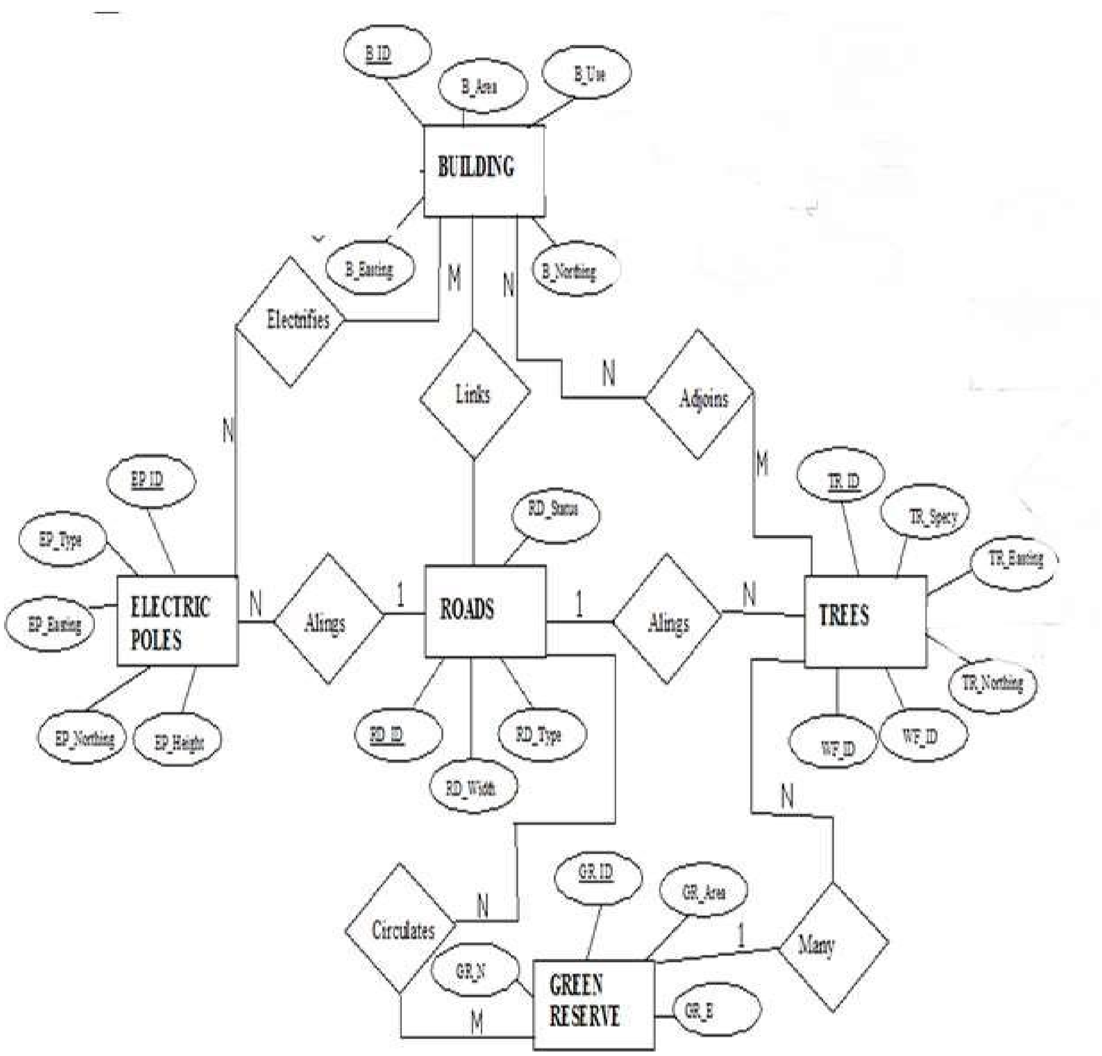


3.1.2 CONCEPTUAL DESIGN

Vector data model is the data type adopted for this project, which is represented, by points, lines and polygon. The identified entities are:-

a. Roads (line)
b. Electric poles (point)
c. Trees (point)
d. Buildings(polygon)

Fig. 3.2: E-R Diagram (Entity relationship diagram)



3.1.3 LOGICAL DESIGN

This is the design aspect of the database refers to the process of creating a conceptual framework or model that represents the structure and organization of spatial data within the system. It involves defining the data element, their relationship, and the rules for datamanipulation and analysis. In this phase, the entities, their attributes and their relationships are represented in a single uniform manner in form of relation in such a way that would be no information loss and at the same time no unnecessary duplication of data. In this study, the logical database design is employed to generate a geo-relation database structure. Each entity has unique identifier in bold type. An attribute type or combination of attribute types that serves to identify an entity type is termed an identifier.

i. Building(B_ID, B_Area, B_Name, B_Easting, B_Northing)
ii. Roads (R_ID, R_Width, R_Type, R-Condition, R_Easting, R_Northing)
iii. Vegetation (V_ID,GR_Area,)
iv. ree (TR_ID, TR_spp, TR_Importance, TR_Easting, TR_Northing)
v. Electric Pole (EP_No, EP_Type, EP_Height,EP_Easting, EP_Northing)

3.1.4 PHYSICAL DESIGN

Table 3.1: Building and its attribute

ENTITY	DESCRIPTION
B_ID	Building Identification
B_name	Building Name
B_Area	Building Area
B_Easting	Building Easting
B_Northing	Building Northings

Table 3.2: Road and its attributes

ENTITY	DESCRIPTION
R_ID	Road Identifier
R_Length	Road Length
R_Width	Road Width
R_Type	Road Type
R_Condition	Road Condition

Table 3.3 : Trees and its attributes

ENTITY	DESCRIPTION
TR_ID	Tree Identifier
TR_Spp	Tree specy
TR_E	Tree_Easting
TR_N	Tree Northing

Table 3.4: Electric Poles and its attributes

ENTITY	DESCRIPTION
EP_ID	Electric pole Identifier
EP_Type	Electric pole Type
EP_Height	Electric pole Height
EP_E	Electric pole Easting
EP_N	Electric pole Northing

Table 3.5: Vegetation and its Attributes

ENTITY	DESCRIPTION
V_ID	Vegetation Identifier
V_Area	Vegetation Area
V_E	Vegetation Easting
V_N	Vegetation Northing

3.2 RECONNAISSANCE

This stage represents the groundwork laid prior to the execution of the project. It involves gathering all available and relevant information about the project area to ensure a smooth and effective implementation.

The necessary steps for the successful execution of the project are divided into two main phases:

1. Office Planning
2. Field Reconnaissance

3.2.1 OFFICE RECONNAISSANCE

This phase entails the collection and review of information related to the study area. It also includes testing the instruments intended for use during the project, listing the required equipment, estimating the number of days needed for field activities, and outlining how each task will be performed. Additionally, responsibilities are assigned to team members based on the supervisor's guidance and instructions.

Table. 3.6: Coordinates of Controls

Station	Northing (m)	Easting (m)	Height (m)
PBIL3306	940288.197	678281.701	355.212
PBIL3304	940275.508	678254.250	350.532
PL1	939677.97	678331.46	349.087

Source: Surveying and Geo-informatics Department Kwara state polytechnic.

3.2.2 FIELD RECONNAISSANCE

The field reconnaissance is the first visitation to the project site to get intimated with theenvironment.

i. Boundary points was selected
ii. The distribution of features was studied
iii. Controls to be used were located
iv. Method and type of instrument to be uses was determined
v. Subsidiary point for Ground control Points were picked and define using nail and bottle cock
vi. A diagram of the study area was drawn.

Fig. 3.3: Recce diagram of the study area (not drawn to scale)

3.3 EQUIPMENT USED/ SYSTEM SELECTION AND SOFTWARE

3.3.1 HARDWARE USED

i. Total station
ii. 1 reflector with a tracking rod.
iii. 1 Tripod
iv. One (1) 50m tape
v. One (1) umbrella
vi. 1 cutlass
vii. Hand held GPS
viii. Hammer
ix. Nails and bottle cover
x. Field book and writing materials
xi. 1-No of Personal Computer HP655 and its accessories
xii. 1-No of HP DeskJet K7100 A3 printer
xiii. 1-No of HP DeskJet 1110 A4 printer

3.3.2 SOFTWARE COMPONENT

i. Notepad.
ii. Microsoft Excel.
iii. AutoCAD 2007
iv. ArcGIS 10.3
v. Surfer 2010
vi. Microsoft Word.

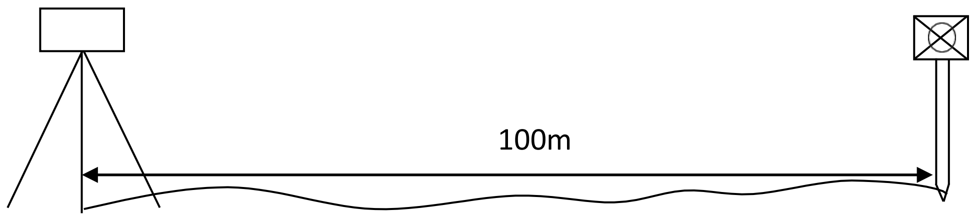
3.4 INSTRUMENT TEST

To ensure data quality, the Total Station used in this project was tested for both **vertical index error** and **horizontal collimation error**. These tests were conducted to confirm the instrument's accuracy, efficiency, and overall reliability before use. The procedures followed are detailed below.

3.4.1 HORIZONTAL COLLIMATION TEST

This test was conducted to ensure that the line of sight was perpendicular to the trunnion axis. The Total Station was positioned over a specific point, and initial adjustments were made to ensure proper alignment, leveling, and focus (to eliminate parallax in the telescope). Avertical target was placed at a distance of 100 meters from the Total Station. To access the configuration menu of the Total Station, the menu key was pressed and held for approximately 2 seconds. From the main menu, the calibration sub-menu was selected, and within that, the horizontal collimation test option was chosen. The target was then observed and divided into two halves, with horizontal readings recorded for Face left and Face right. The readings are shown in Table 3.4.1 below.

Total Station REFLECTOR (TARGET)



STATION A Fairly Level Ground STATION B

Fig 3.4: Horizontal Collimation and Vertical Index error test.

Table 3.7: Horizontal Collimation Data

Station	Target	Face	Hz Reading	Difference	Error
A	B	L	38˚42‛32”		
		R	218˚42‛35”	180˚00‛03”	03”

3.4.2 VERTICAL INDEX ERROR TEST

This test was conducted to verify the accuracy of the vertical angle measurement when the line of sight is perfectly horizontal. The expected reading for this test is exactly ninety degrees (90°); any deviation from this value is known as the **vertical index error**.

The Total Station was set up over a designated point, with necessary temporary adjustments made to ensure proper alignment and functioning. A target was placed approximately 100 meters away, and the instrument was carefully aimed at it. The target was bisected by aligning the instrument in the **Face Left** position, and the corresponding vertical angle reading was recorded. The process was then repeated with the instrument in the **Face Right** position, and that reading was also documented. The recorded values are presented below.

Table 3.8: Vertical Index Data

Instrument Station	Target Station	Face	Vertical	Sum	Error
A	B	L	90˚00‛00”		
		R	270˚00‛02”	360˚00‛02”	02”

3.4.3 ANALYSIS OF COLLIMATION AND VERTICAL INDEX DATA

The reading obtain during calibration were reduced to obtain new collimation and verticalerrors.

Horizontal collimation = {(FR – FL) – 180}/2 = {(00˚00‘‘03”}/2 = 1.5”

Vertical collimation = {(FL + FR) – 360} = (90˚00‘‘00” + 270˚00‘‘02”) - 360} = 02”The result shows that the instrument is still in good working condition.

3.4.4 CONTROL CHECK

Three control beacons (PBIL3306, PBIL3304) were utilized in this project. To verify their positions on-site, a check was performed by measuring the angles between these beacons and comparing the observed angles with those calculated from their known coordinates.

The Total Station was set up on the control beacon PBIL3304. After completing all necessary temporary adjustments, the reflector was positioned on the control beacon PBIL3306, designated as the back station. A horizontal angle reading was taken and recorded with the instrument set to **Face Left**.

Next, the reflector was moved to the control beacon PL1, the forward station. Horizontal angle readings were then recorded in both **Face Left** and **Face Right** positions. Finally, the reflector was returned to the back station, and a horizontal angle reading was recorded with the instrument set to **Face Right**.

Table 3.9: Table showing the back computation of the control coordinates

From STN	Bearing	Dist(m)	ΔN	ΔE	Northing(m)	Easting (m)	To STN
					940288.197	678281.701	PBIL3306
PBIL3306	65°11'30"	30.242	-12.689	-27.451	940275.508	678254.250	PBIL3304
PBIL3304	7°21'45"	602.506	-597.538	77.21	939677.97	678331.460	PL1

Table 3.1 0 : Table showing the distance observation result of the control check

FROM	OBSERVED DISTANCE(m)	COMPUTED DISTANCE (m)	TO
PBIL3306	30.140	30.242	PBIL3304
PBIL3304	602.451	602.506	PL1

Table 3.11: Table showing the observation result of the control check

STN	SIGHT	FACE	OBSERVED HZ ANGLE	REDUCED HZ ANGLE	MEAN
	PBIL3306	L1	357° 08' 35"		
PBIL3304	PL1	L2	291° 57' 00"	65°11'35"	
	PL1	R2	111° 57' 1"	65°11'25"	
	PBIL3306	R1	177° 08' 35"		65°11'30"

Difference in angle (observed - computed) =65° 11' 30"-65° 11' 25"

= 00° 00' 05"

Since the allowable accuracy (angular) of third order traverse of one station is 00° 00' 30" and the result obtained from the control check (00° 00' 05") is less than allowable error. Therefore, the controls were angularly intact.

3.5 MONUMENTATION

The boundary of the area carved out was demarcated with the precast concrete beacons, after clearing the required line of sights. The identified points of changes in directions were dug and beacons were buried on it, leaving about 15cm part of the beacon above the ground level. The beacons were buried at convenient distances as dictated by the nature of the boundary.

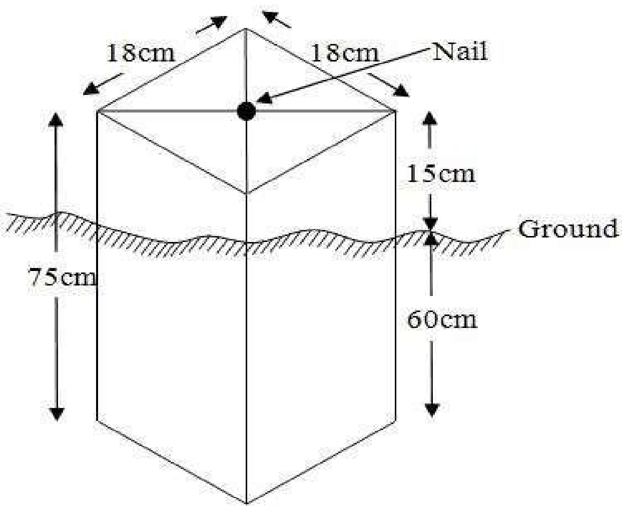


Fig. 3.5: Pillar Description

3.6 DATA ACQUISITION

PRIMARY DATA SOURCE

Field observation served as the primary data source for this project. A ground-based method was employed to collect data using a Total Station instrument, which involved recording X, Y, and Z coordinates from Ground Control Points (GCPs) established at prominent locations throughout the study area.

SECONDARY DATA SOURCE

An updated imagery of the area was obtained from Google Earth and used to determine the extent of coverage for the project area.

3.6.1 GEOMETRIC DATA ACQUISITION

The Total Station instrument was carefully set up on control point PBIL3304, with a back sight taken to PBIL3306 after performing the necessary station adjustments, which included centering, leveling, and focusing. The following procedures were then followed to determine the position of the next point (PL1), and this process was repeated sequentially until the entire site was covered. The data acquisition method used on site was the **radiation method**, where two or more points are coordinated from a single instrument station.

Procedure:

i. After setting up the instrument and completing temporary adjustments, the instrument was powered on, and a new job was created under the job menu in the instrument's internal memory. The job was named **GROUP 5A**.

ii. The coordinates of the three control points were entered into the instrument's memory, along with relevant codes such as:

- 'RD' for roads
- 'SP' for spot heights
- 'BD' for buildings, etc.

iii. The instrument height and reflector height were measured and saved in the instrument memory.

iv. In the coordinate menu, orientation was set by inputting the coordinates of the instrument station and the back sight. The reflector at the back station was carefully bisected before confirming the orientation by selecting 'yes'.

v. After orientation, the reflector was bisected at the next point (nail), and the **'obs'** (observe) option was selected. The three-dimensional coordinates (East, North, Height) of the point were displayed on the instrument's screen, and **'rec'** (record) was pressed to save the data. For subsequent observations, the **'all'** option was used to streamline the process without separately pressing 'obs' and 'rec'.

vi. It was ensured that the prism center of the reflector was precisely bisected and securely set on the tripod to minimize height measurement errors.

vii. The instrument was then moved to the next point after all details—including spot heights and boundary points visible from the current station—were recorded. Temporary adjustments were made after repositioning.

viii. This sequence was repeated until all boundary points and their heights were accurately coordinated.

ix. Spot heights in this project were acquired randomly rather than at regular grid intervals. Additionally, three edges of each building were surveyed.

x. Upon completion of the data acquisition, all collected details were properly recorded and mapped to their respective positions on the project plan.

3.6.2 ATTRIBUTES DATA ACQUISITION

Attribute data is information about spatial features. They provide the characteristics, description and nomenclature about spatial objects. Thus the attributes data acquired includes names of buildings and their uses such as classrooms, roads, water facilities and prominent natural features likes river and trees found and vegetation were properly identified within andaround the study area.

3.7 DATA DOWNLOADING AND PROCESSING

3.7.1 DATA DOWNLOADING AND EDITING

This is stage whereby all data acquired which were automatically stored in the Total Station were downloaded into personal computer. This was done with the aid of downloading cable connected to the computer and some associated complementing software installed on the System.

3.7.2 DATA PROCESSING AND DATA EDITING

The geometric data downloaded were further processed in order to convert it to a useful format and to enhance its accuracy. The output coordinates, were edited and exported in *.txt, *.xls and *.pdf format. Thereafter, they were imported into Arc GIS 10.3 for further operations and to carry out spatial analysis.

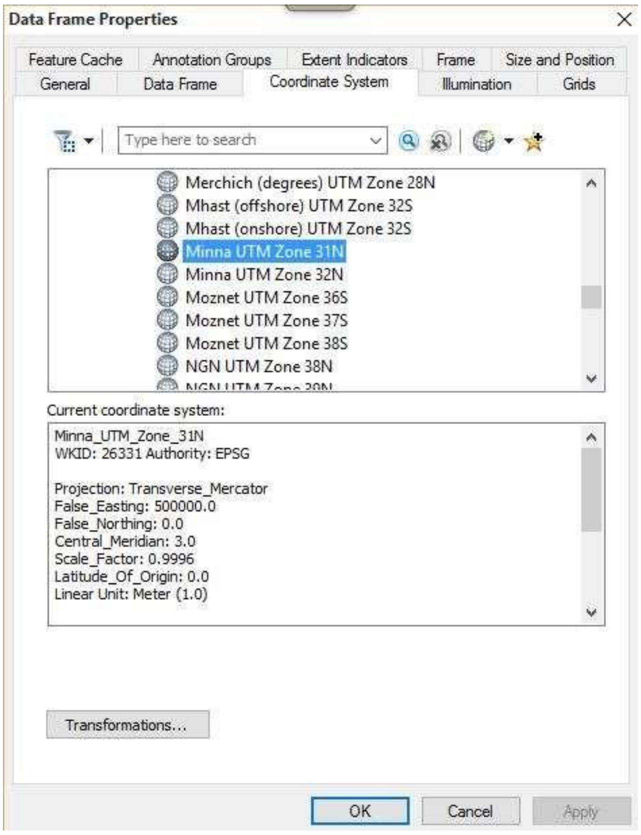
3.7.3 DATA PROCESSING USING ARCGIS 10.3

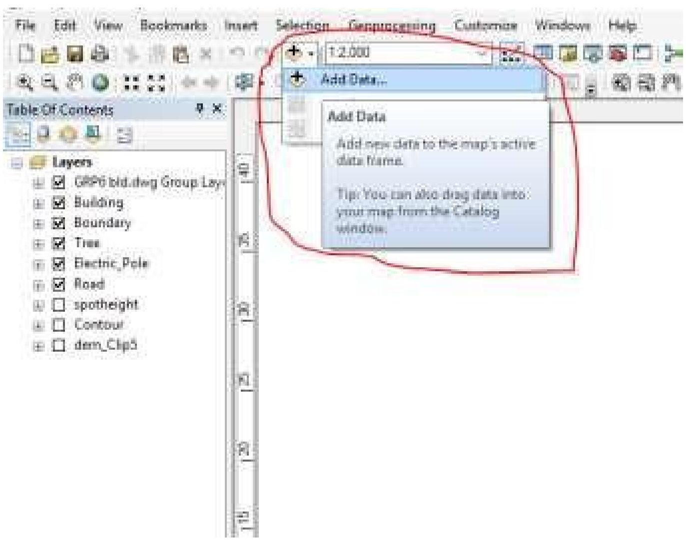
Before launching ArcGIS, AutoCAD was used to plot feature data, which were saved separately in different files named **road**, **boundary line**, **buildings**, **trees**, and **electric poles**.

Steps to load and prepare data in ArcGIS 10.3:

1. Launch **ArcMap** in ArcGIS 10.3.
2. In the dialog box that appears, click **A NEW EMPTY MAP** to create a new project.
3. On the menu bar, click **Tools**, then select **Extensions**. Check all available extensions, then close the window.
4. On the left-hand side (LHS), right-click on **Layers**, and select **Properties**.

5. In the **Properties** window, go to the **Coordinate System** tab to set the projection system to **MINNA DATUM ZONE 31N**. Then, go to the **General** tab to set the map units. Click **Apply** and then **OK**.
6. Click **Add Data** on the toolbar, browse to the saved AutoCAD files, select all relevant files, and load them into the **Table of Contents** (Layer section).

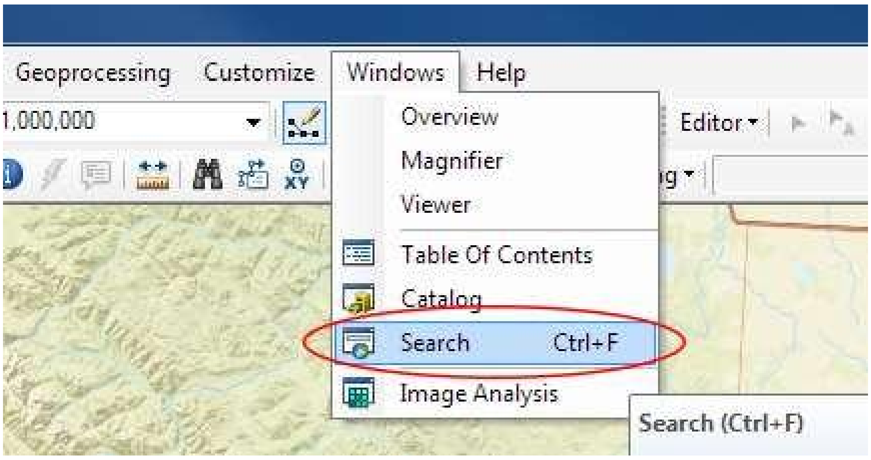




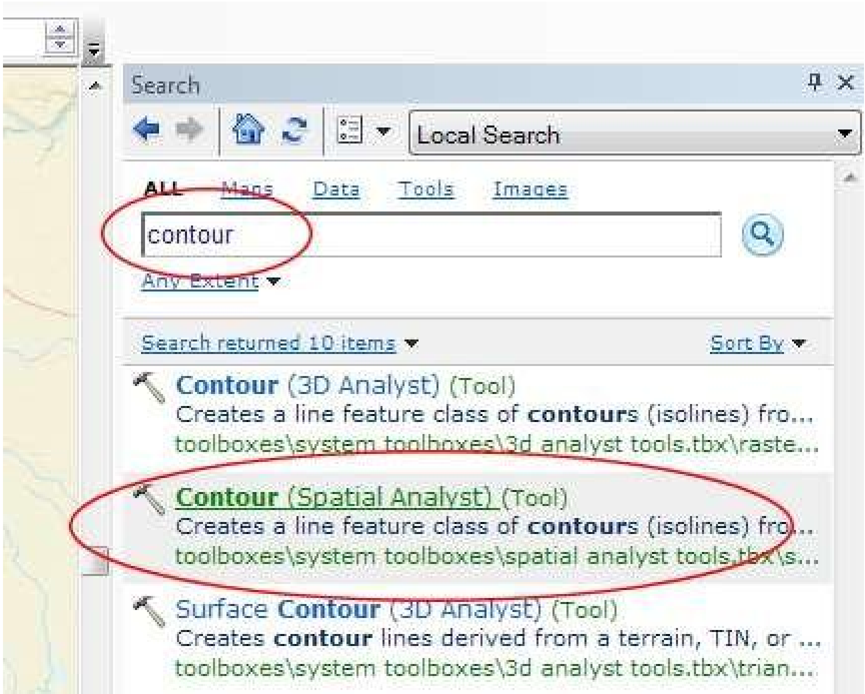
All drawing was exported to shape file. After the feature class has been creates, click onEditor to start Editing, and then click on the load object.

Creating Contours

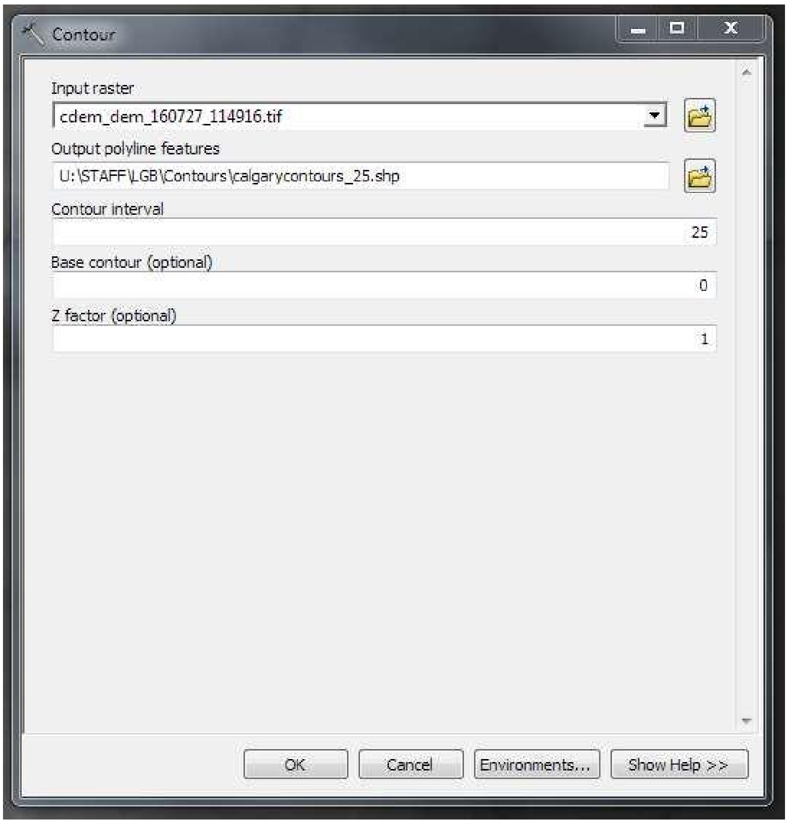
1. First, a Digital Elevation Model (DEM) was created by using the **Natural Neighbor** interpolation method. To do this, open the **Search** bar and type **Interpolation**, then select **Natural Neighbor**.
2. Choose the **XYZ** data as the input for creating the DEM, setting the project **boundary line** as the extent for the interpolation.
3. To generate contours, ensure that the **Spatial Analyst** toolbar is enabled. You can activate it by navigating to **Customize > Toolbars > Spatial Analyst**.
4. Alternatively, open the search bar by clicking **Windows > Search** or by clicking the search icon and type relevant commands or tools.



In the search bar type **Contour**, and select **Contour (Spatial Analyst)** from the searchresults list.



After choosing **Contour**, a dialogue window will appear, prompting you for five settings: **Input raster:** select the DEM file from which you want to generate contours by locating it on your hard drive or in the dropdown menu, showing layers present in the Table of Contents **Output polyline features**: indicate where you want to save your output contours **Contour interval:** set the distance between contour lines in meters – the smaller the number, the greater the number of lines **Base contour (optional):** the starting point from which the lines are generated – for example, the default is 0 so with an interval of 25 meters, the contours are generated at 25, 50, 75, 100…, but if the base contour is set at 40, then the contours are generated at 65, 90, 115, 140 and so on **Z factor (optional):** can be used to adjust the units of data; for example, if you have data in meters and you want to produce your contours in feet, use a z-factor of 3.28 because 3.28 feet equals one meter.



The generated contours will automatically be added to the map.

Input the data which is the AutoCAD drawing and select the feature type you want to load,

- Click Add and Next, then select the Target layer you want it to be
- Load it into from the feature class created on the ARCGLS.
- Click on Next, then select "only the features that satisfy the
    - Query" and click on Query Builder to query for the feature to be loud e.g. "layer" = Boundary".

- Click on Next....................... Then finish

Right click on the Boundary In the table of content and click on zoom to layer to display thefeature.

EDITING, CONVERTING AND MERGING GEODATABASE

- Remove all necessary features by right clicking on it and press "REMOVE"
  - Convert some features that are not in their correct „features -type‟ like point, line, and polygon features etc.

To convert a GOEDATABASE FEATURE CLASS to another the following steps weretaken:

- FOR LINE FEATURE CLASS TO POLYGON FEATURE CLASS
- Go to WINDOW on the menu bar and select ARC Toolbox.
  - Select DATA MANAGEMENT TOOLS, click on FEATURES, and then Select FEATURE TO POLYGON.
  - ON INPUT FEATURES, select feature to be converted, on OUTPUT FEATURE CLASS, then save on the GRP6C FOLDER, press OK and CLOSE.
  - Then remove the converted feature class in the LAYER Menu and ARC CATALOGfiles.
  - On INPUT DATASETS, select features to be merged, on OUTPUT DATASETS,then save on the GRP6C folder, press OK and CLOSE.
  - Then remove the converted feature class in the LAYER Menu and ARC CATALOGfiles.

TABLE CREATION

There is need to create attribute tables for the features so as to be used for queries. NOTE: The editor on the menu bar must be stopped before adding field to its table. **THE FOLLOWING PROCEDURES WERE FOLLOWED:**

- Right click on the feature class, then select OPEN ATTRIBUTES TABLE click on OPTIONS and select ADD FIELD.
- Give it FIELD NAME, click on TYPE and select [SHORT INTEGER or LONG INTEGER for SHORT or LONG WHOLE VARIABLES or DOUBLE FOR

DECIMAL VARIABLES OR TEXT variable or DATE for DATE], then enter precision or LENGTH for text width and scale for DECIMAL PLACES, and then click OK

- To input variables on the ATTRIBUTE TABLE, go to the EDITOR on Menu bar, select START EDITING,
- Click on ATTRIBUTE on menu bar [behind the TARGET], click on the features on the DATA VIEW display, and then input the variables of data acquired through SOCIAL SURVEY or DATA ACQUIRED ON THE FIELD.
- Save it after the input by selecting SAVE EDITS on the editor menu. To switch to other layers, select STOP EDITING on the EDITOR menu. Then repeat the above step to create other fields. Populate the table and save.

Table 3.12: Building

Table

BUILDING_A

OBJECTID *	SHAPE *	SHAPE_Length	SHAPE_Area	BLD_OWNER	BLD_USES	X	Y
1	Polygon	84.406847	363.400803	MR RASAQ	<Null>	678416.667	363.400803
2	Polygon	82.710406	369.490638	MRFLORENCE	<Null>	678447.669	369.490638
3	Polygon	36.843475	83.366956	<Null>	<Null>	678455.057	83.366956
4	Polygon	23.084988	33.209357	<Null>	<Null>	678468.524	33.209357
5	Polygon	83.503462	368.60541	<Null>	<Null>	678478.957	368.60541
6	Polygon	79.190294	336.66112	<Null>	<Null>	678441.819	336.66112
7	Polygon	76.940109	316.408618	<Null>	<Null>	678456.75	316.408618
8	Polygon	84.123322	349.316367	<Null>	<Null>	678493.961	349.316367
9	Polygon	78.026213	345.930362	<Null>	<Null>	678556.675	345.930362
10	Polygon	83.563237	343.435734	<Null>	<Null>	678586.112	343.435734
12	Polygon	84.974994	360.811561	<Null>	<Null>	678520.952	360.811561
13	Polygon	86.676746	381.806738	<Null>	SHOP	678499.834	381.806738
14	Polygon	86.169928	382.667674	<Null>	<Null>	678481.732	382.667674
15	Polygon	31.811369	55.853679	<Null>	<Null>	678520.253	55.853679
16	Polygon	44.346327	101.287692	<Null>	<Null>	678387.814	101.287692
17	Polygon	48.472223	119.325622	<Null>	<Null>	678464.797	119.325622
18	Polygon	83.685035	365.801723	<Null>	<Null>	678428.05	365.801723

Table 3.13: Road

ENTITY	FIELD ALIAS	DATA TYPE	FIELD SIZE
R_ID	Road Identifier	Numeric	-
R_Length	Road Length	Numeric	-
R_Width	Road Width	Numeric	-
R_Type	Road Type	Text	10
R_Condition	Road Condition	Text	10

Table 3.14: Trees

ENTITY	FIELD ALIAS	DATA TYPE	FIELD SIZE
TR_ID	Tree Identifier	Numeric	-
TR_Spp	Tree specy	Text	10
TR_E	Tree_Easting	Numeric	-
TR_N	Tree Northing	Numeric	-

Table 3.15: Electric Poles

ENTITY	FIELD ALIAS	DATA TYPE	FIELD SIZE
EP_ID	Electric pole Identifier	Numeric	-
EP_Type	Electric pole Type	Text	10
EP_Height	Electric pole Height	Numeric	-
EP_E	Electric pole Easting	Numeric	-
EP_N	Electric pole Northing	Numeric	-

ADDING SPOT HEIGHTS DATA

- NOTE: STOP EDITING on the EDITOR MENU before adding data field,
- Go to FIELD ON THE MENU BAR, scroll to add Data and then ADD XYZ DATA
    - Browse the EXCEL FILE for SPOT HEIGHTS, select EASTING VALUE on X - FIELD and NORTHING VALUE on Y - IELD and ELEVATION
    - « Select DATA the EXPORT DATA, locate the folder created and give it name then YES AND OK, remove the previous layer by right clicking on it and select REMOVE.

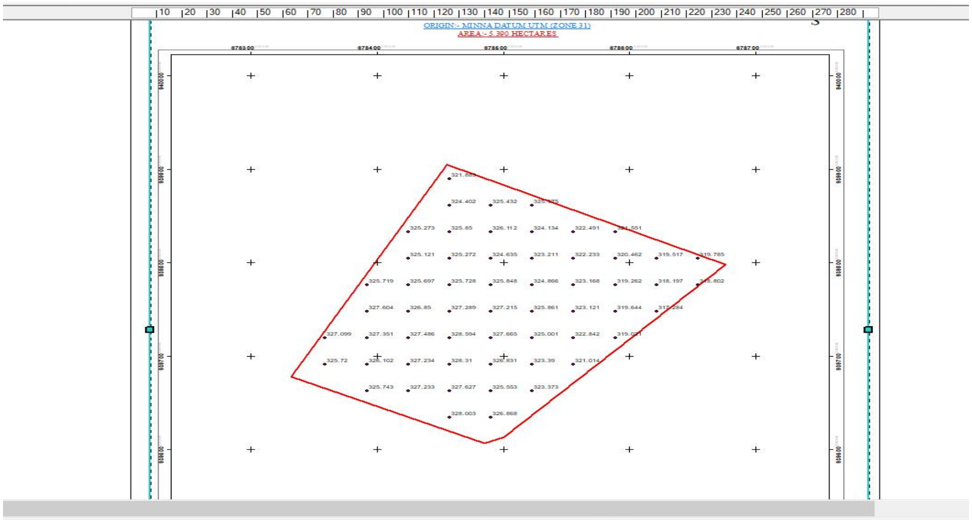


Fig. 3.6 shows the spot height

TIN, ASPECT AND SLOPE CREATION USING ARCMAP

NOTE: Making sure the 3D Analyst Extension is active, select VIEW on MENU bar, then click TOOLBARS and MARK the 3D Analyst EXTENTION Then X, Y Data

TO CREATE TIN

- Click on 3D Analyst arrow, select create TIN and then create TIN from FEATURE.
- On layers mark the SPOTHEIGHT LAYER, select height data on HEIGHT, then ok.

TO CHANGE THE FACE OF THE TIN ACCODING TO ITS ELEVATION

- RIGHT CLICK on the TIN, select PROPERTIES, and click on SYMBOLOGY.
    - Then ADD, select FACE ELEVATION WITH COLOR RAMP, click ADD, and then select APPLY and OK.

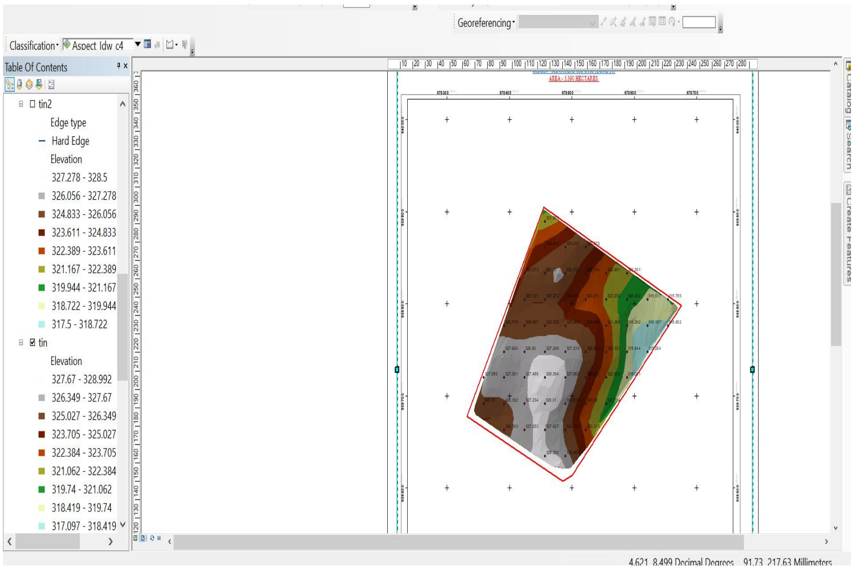


Fig. 3.7: Shows the Tin creation

TO CREATE ASPECT

- Click on 3D analyst arrow, select SPATIAL ANALYST TOOLS, SURFACE and THEN DOUBLE CLICK on ASPECT.
- Browse to where the raster format of all the acquired data created from the surfer was saved to.

- Browse to where you want the OUTPUT RASTER to be saved
- You can change the OUTPUT MEASUREMENT to Degree OR percent
- Click OK [then it displays on the data view screen], then Close.

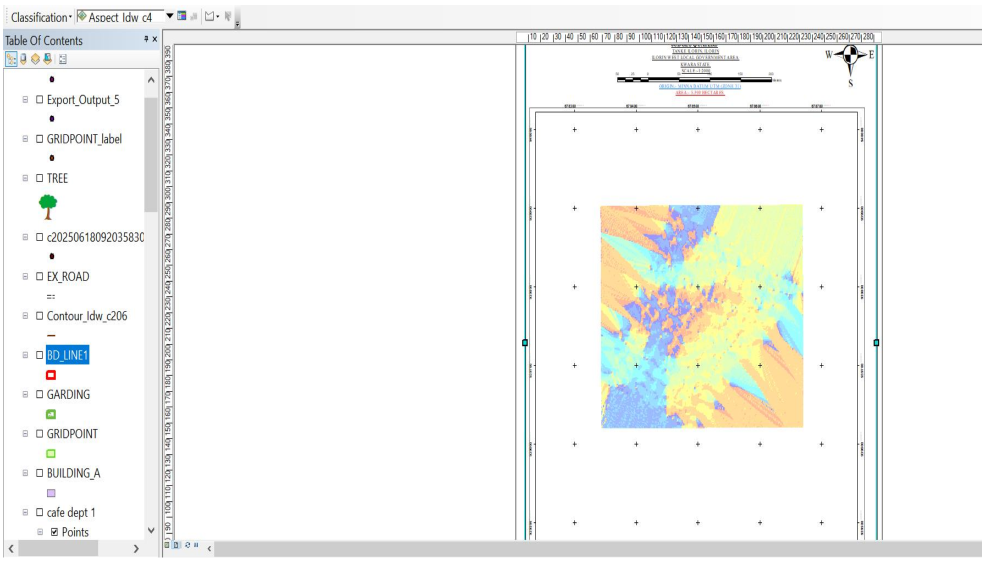


Fig. 3.8 shows the slope aspect

3.8 DATABASE IMPLEMENTATION

This is the database creation phase. Having completed the three stages of design phase (i.e. Reality, Conceptual and Logical design), the database was created using ArcGIS 10.3 software. It involves the combination and storage of acquired graphic data and attributes data in creating the database for the purpose of spatial analysis and query.

Database is an organized integrated collection of data stored so as to be capable of use by revenant application with data being accessed by different logical part. After the Attribute table was populated via the keyboard, some attributes such as areas of settlements were automatically displayed by special command in the ArcGIS 10.3 version. The ArcGIS software was used to link the graphic data and table for query generation.

3.8.1 DATABASE MANAGEMENT SYSTEMS

Database management refers to a collection of software designed for creating, storing, manipulating, updating, organizing, and querying information within a database (Kufoniyi, 1998). A Database Management System (DBMS) functions as intermediary software that manages the database on behalf of the user.

A good DBMS should provide the following key functions:

a. Efficient storage and retrieval of data.

b. Concurrent access by multiple users.

c. A standardized interface between the database and application programs.

d. Standardized data access and clear separation of data storage/retrieval from the application logic.

e. Maintenance of data security and integrity.

3.8.2 DATABASE MAINTENANCE

After creating the database, proper maintenance practices were implemented to ensure it met its stated objectives. Maintenance allowed for the addition of new data and removal of outdated or irrelevant information. Regular updates are essential to reflect physical changes in the landscape over time. Additionally, security and data integrity measures were enforced to maintain the database's reliability and effectiveness.

Consistent updating and management of the database are crucial for maintaining its currency and quality, which in turn enhances its suitability as part of a Spatial Decision Support System (SDSS). The overall quality of a database depends on its timeliness and fitness for use within a decision support framework.

It is also important to periodically review the storage media to prevent data inaccessibility or deterioration due to physical damage. Care must be taken when populating the database, as its value directly depends on the accuracy and quality of the input data.

For long-term archiving, stable storage media should be used, such as:

- Computer-compatible tape readers
- Magnetic tapes
- Optical discs and compact discs

3.9 BACK COMPUTATION

Table ***3.16: Back Computation***

S/N	BEARING	DIST	Δ N	Δ E	X	Y
PT1					678331.46	939677.97
PT2	28.517403	258.4696	227.11	123.40	678454.86	939905.08
PT3	64.10621	245.4521	-107.19	220.81	678675.67	939797.89
PT4	43.628299	254.3273	-184.09	-175.48	678500.19	939613.80
PT5	65.699528	16.52403	-6.80	-15.06	678485.13	939607.00
PT1	65.210911	169.2667	70.97	-153.67	678331.46	939677.97

3.9.1 AREA COMPUTATION

Table 3.17: Area Computation

X	Y	P	Q
678331.46	939677.97		
678454.86	939905.08	637567185177.817	637529085581.434
678675.67	939797.89	637610445888.245	637890709905.404
678500.19	939613.80	637693025256.246	637653046926.599
678485.13	939607.00	637523528025.330	637513991242.794
678331.46	939677.97	637557529633.586	637364988136.220
		3187951713981.220	3187951821792.450
		2A	107811.227
		AREA	53905.614
		HECTARES	5.391

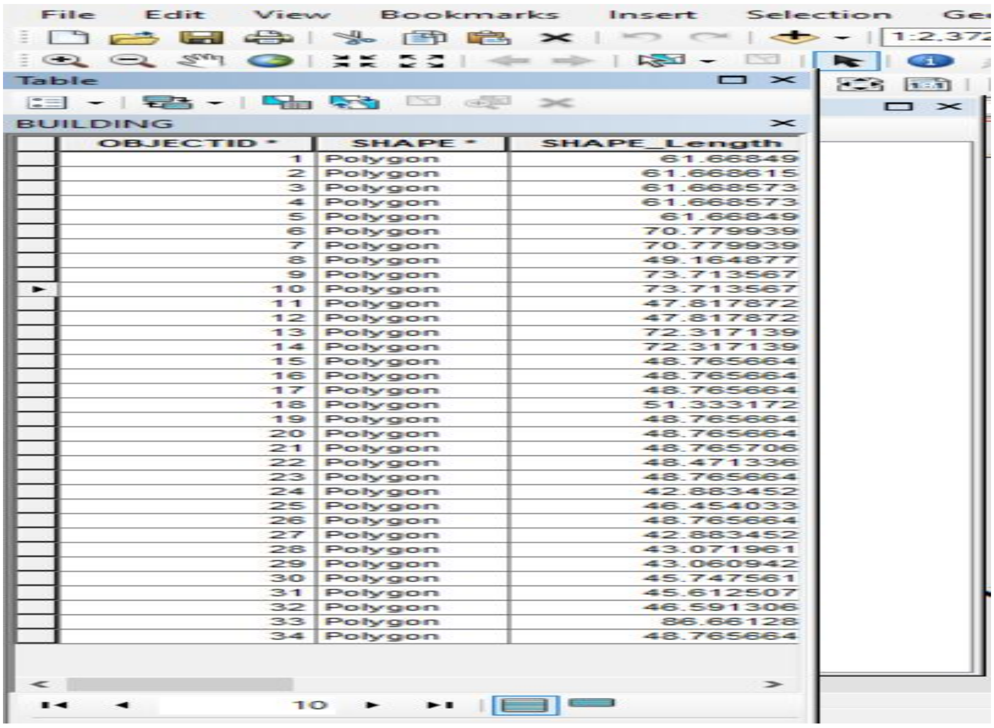
CHAPTER FOUR

4.0 SPATIAL ANALYSES AND PRESENTATION

GIS stands out among other information systems due to its powerful spatial analytical capabilities, including overlay operations, buffering, spatial search, topographic analysis, as well as neighborhood and connectivity operations. GIS leverages these capabilities to answer fundamental questions related to location, condition, trends, routing, patterns, and modeling through the manipulation and analysis of spatial data. In this project, the major analyses performed were overlay operations, topographic analyses, and spatial searches.

4.1 TESTING OF DATABASE

This test was conducted to evaluate the relationships between data modeled as entities in the spatial database and to assess the database's retrieval capabilities. A sample query with specific conditions was designed and executed to verify whether the desired results could be obtained.



OBJECTID *	SHAPE *	SHAPE_Length
1	Polygon	61.66849
2	Polygon	61.668615
3	Polygon	61.668573
4	Polygon	61.668573
5	Polygon	61.66849
6	Polygon	70.779939
7	Polygon	70.779939
8	Polygon	49.164877
9	Polygon	73.713567
10	Polygon	73.713567
11	Polygon	47.817872
12	Polygon	47.817872
13	Polygon	72.317139
14	Polygon	72.317139
15	Polygon	48.765664
16	Polygon	48.765664
17	Polygon	48.765664
18	Polygon	51.333172
19	Polygon	48.765664
20	Polygon	48.765664
21	Polygon	48.765706
22	Polygon	48.471336
23	Polygon	48.765664
24	Polygon	42.883452
25	Polygon	46.454033
26	Polygon	48.765664
27	Polygon	42.883452
28	Polygon	43.071961
29	Polygon	43.060942
30	Polygon	45.747561
31	Polygon	45.612507
32	Polygon	46.591306
33	Polygon	86.66128
34	Polygon	48.765664

Fig. 4.1: Shows the attribute database

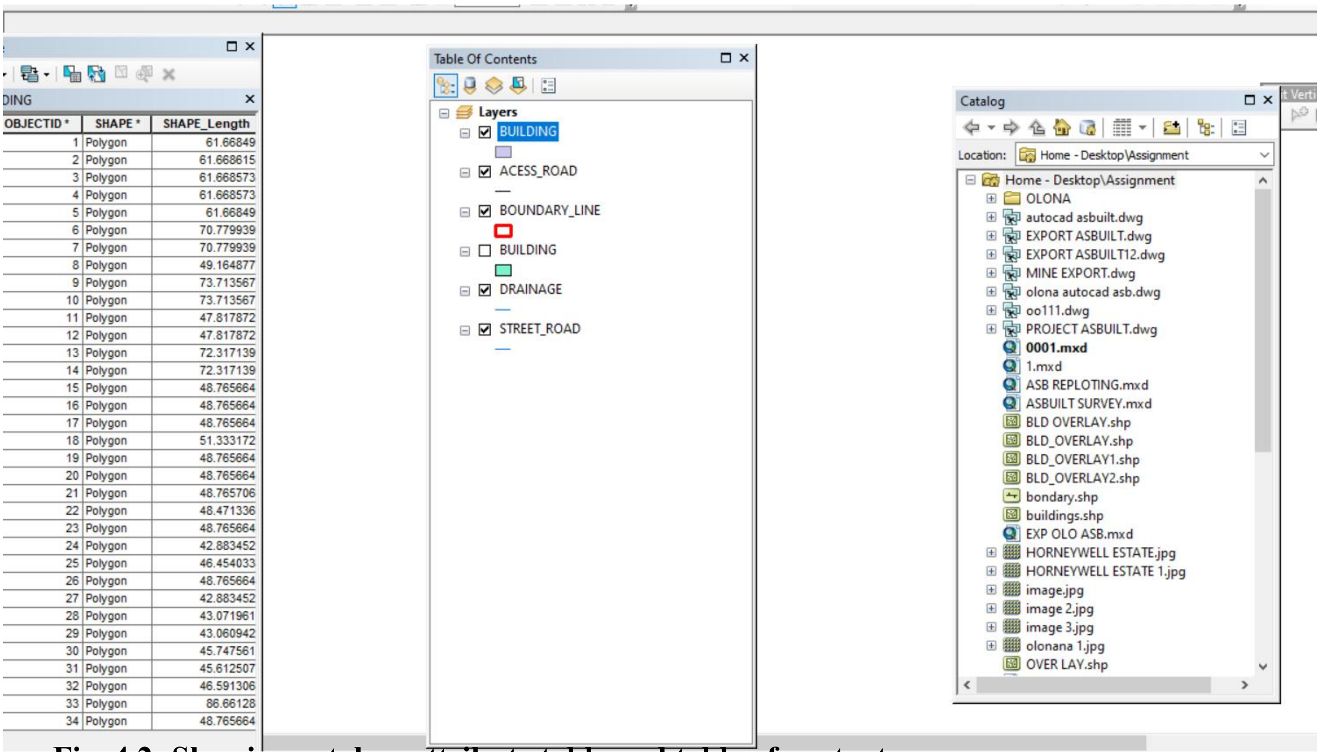


Fig. 4.2: Showing catalog, attribute table and table of content

Analysis of Result

The query retrieved contours with elevation values greater than or equal to 350 meters, indicating areas likely to be less prone to flooding within the project area, as shown in Figure 4.5 (Query 1). These contours represent points with elevations above 350 meters.

The attribute table confirmed that the northeast part of the institute has the highest elevation. Elevation is a critical factor when considering terrain surface and slope. Conversely, the southwest part of the school has the lowest elevation and is therefore more susceptible to erosion. Buildings planned for this region should have foundations elevated significantly above ground level to mitigate potential damage.

The results of this query provide valuable information to the school management, enabling informed decisions about terrain characteristics and appropriate building designs across different regions of the project area.

SINGLE SELECTION CRITERION

Query 1: Retrieving Area whose height is Greater than 350 meters

SELECT* **FROM** Contour **WHERE** "CONTOUR">3.007

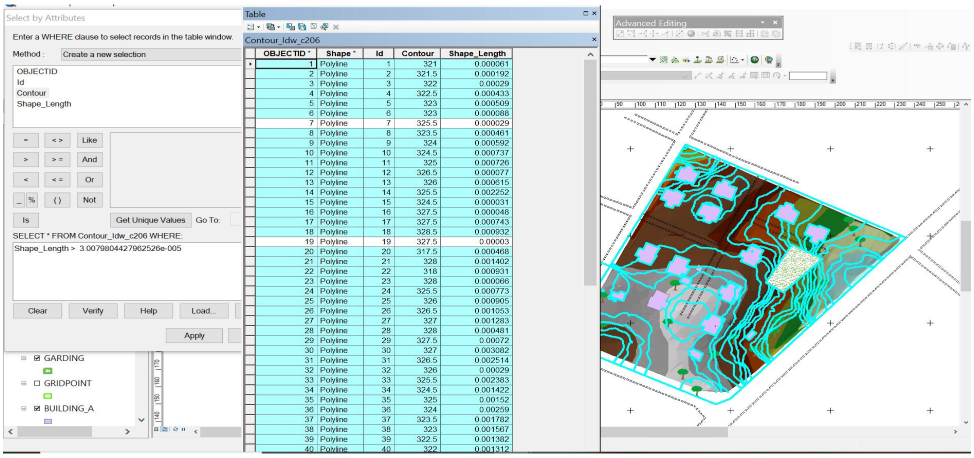


Fig 4.3.: Retrieving Area whose height is greater than 3.007 meters

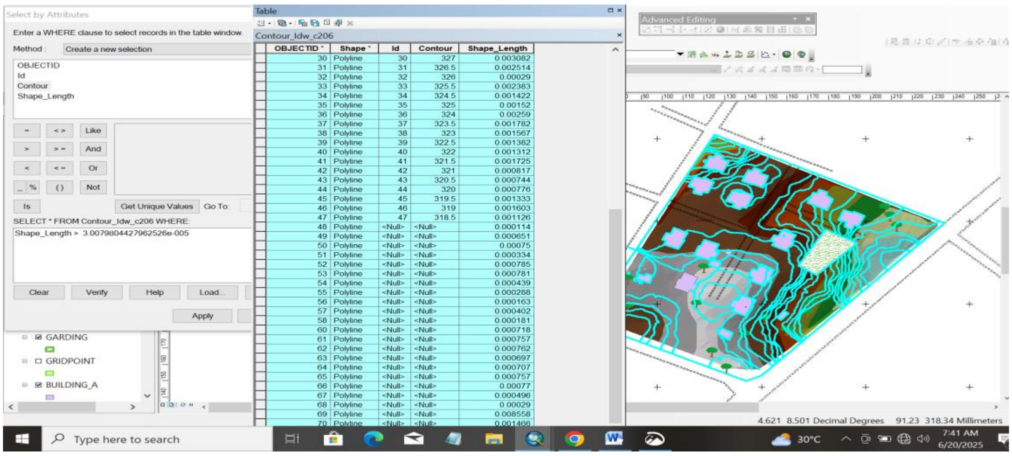


Fig 4.4: Result of area whose height is greater than 3.007 meters

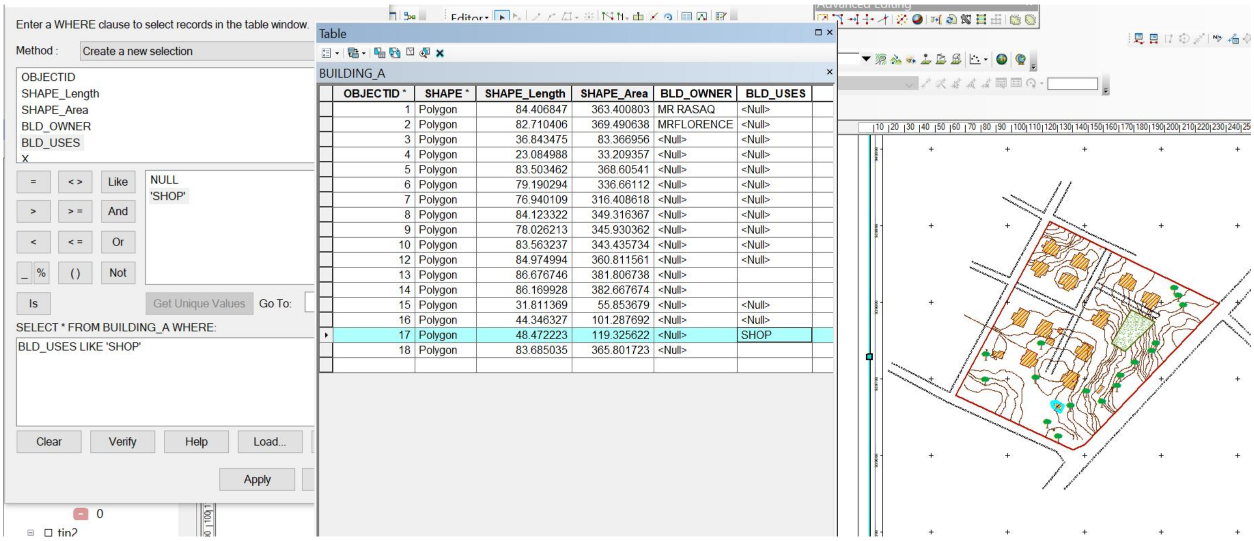
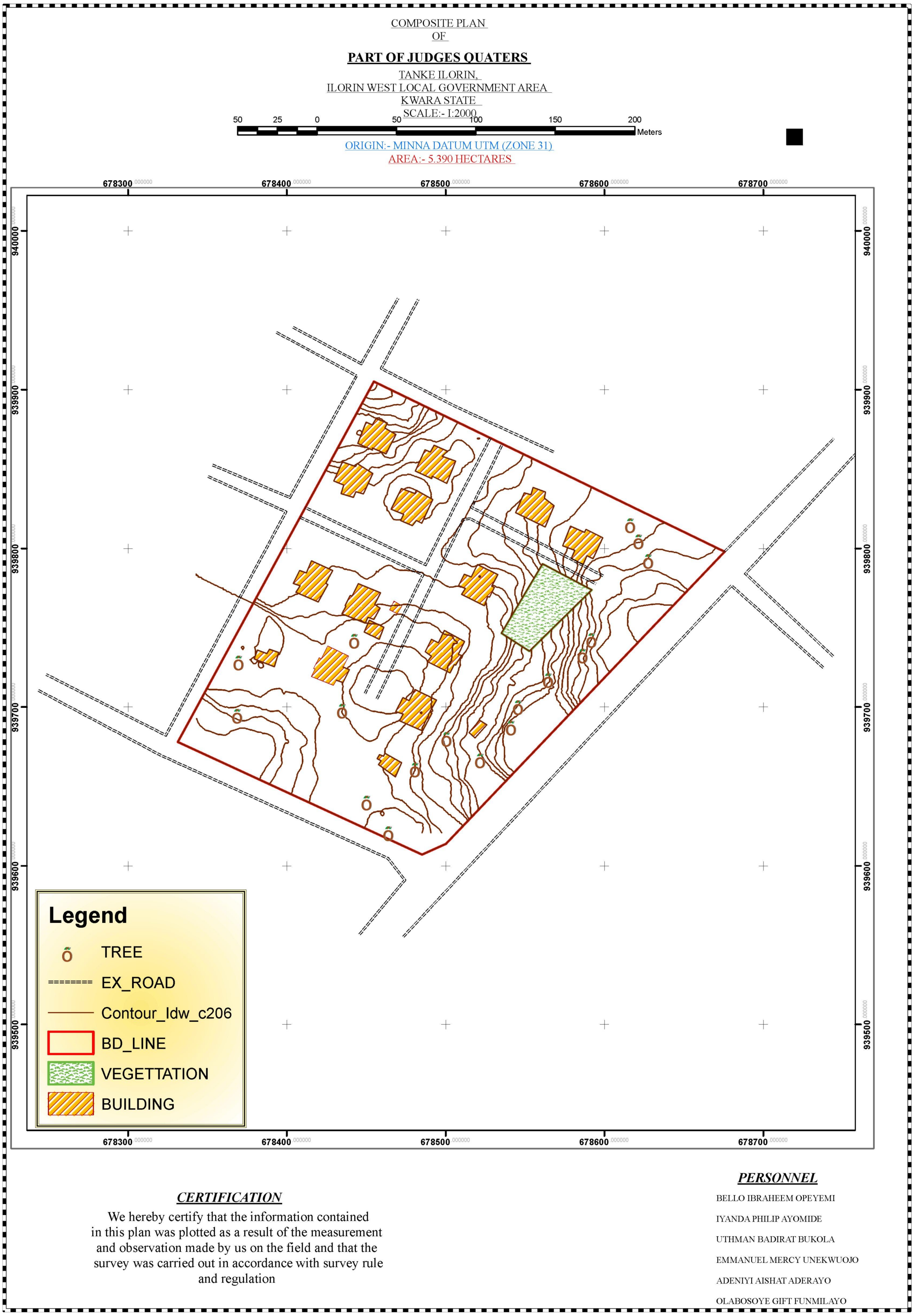


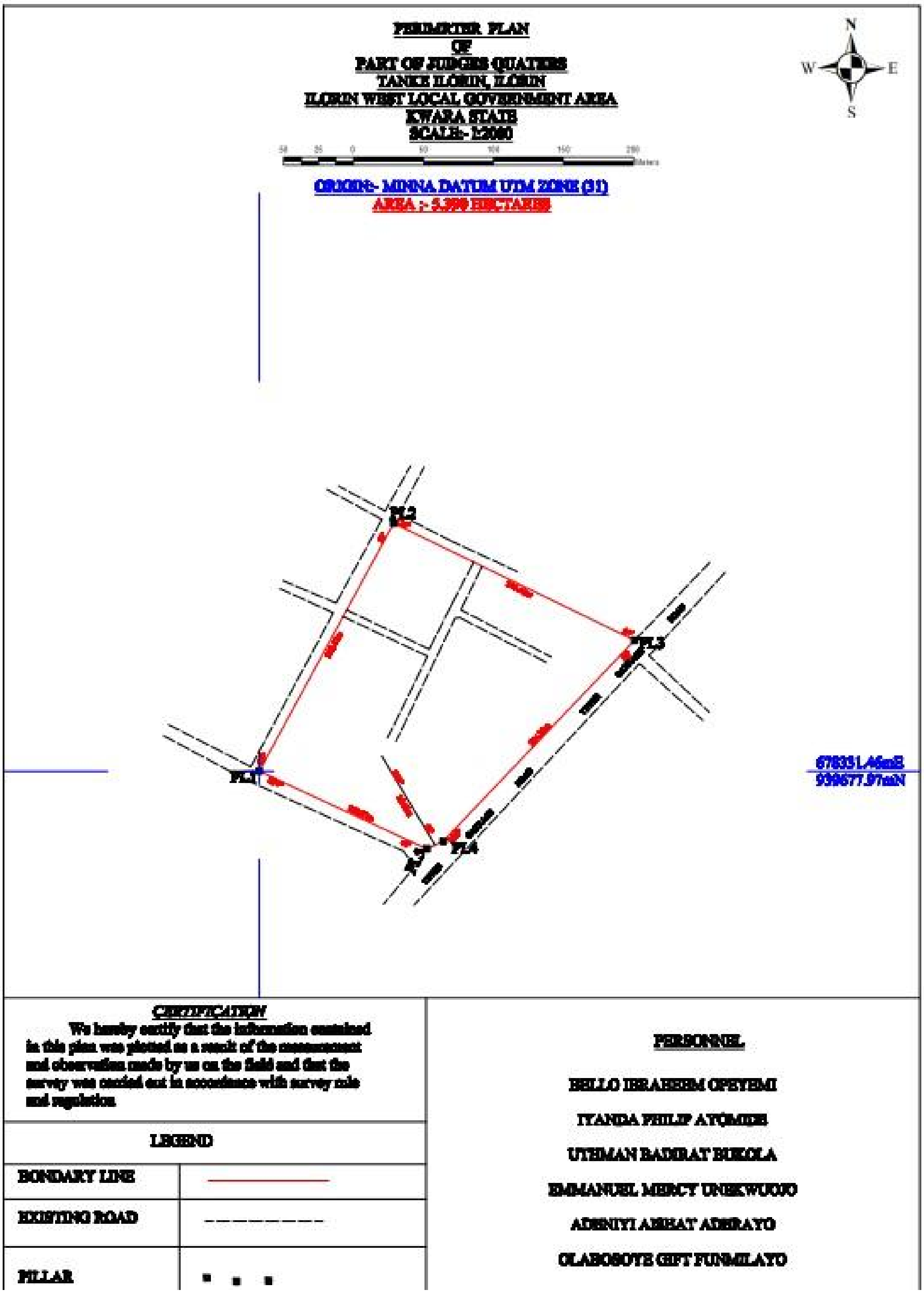
Fig 4.5: Shows the building use for shop

4.2 INFORMATION PRESENTATION AND RESULT ANALYSIS

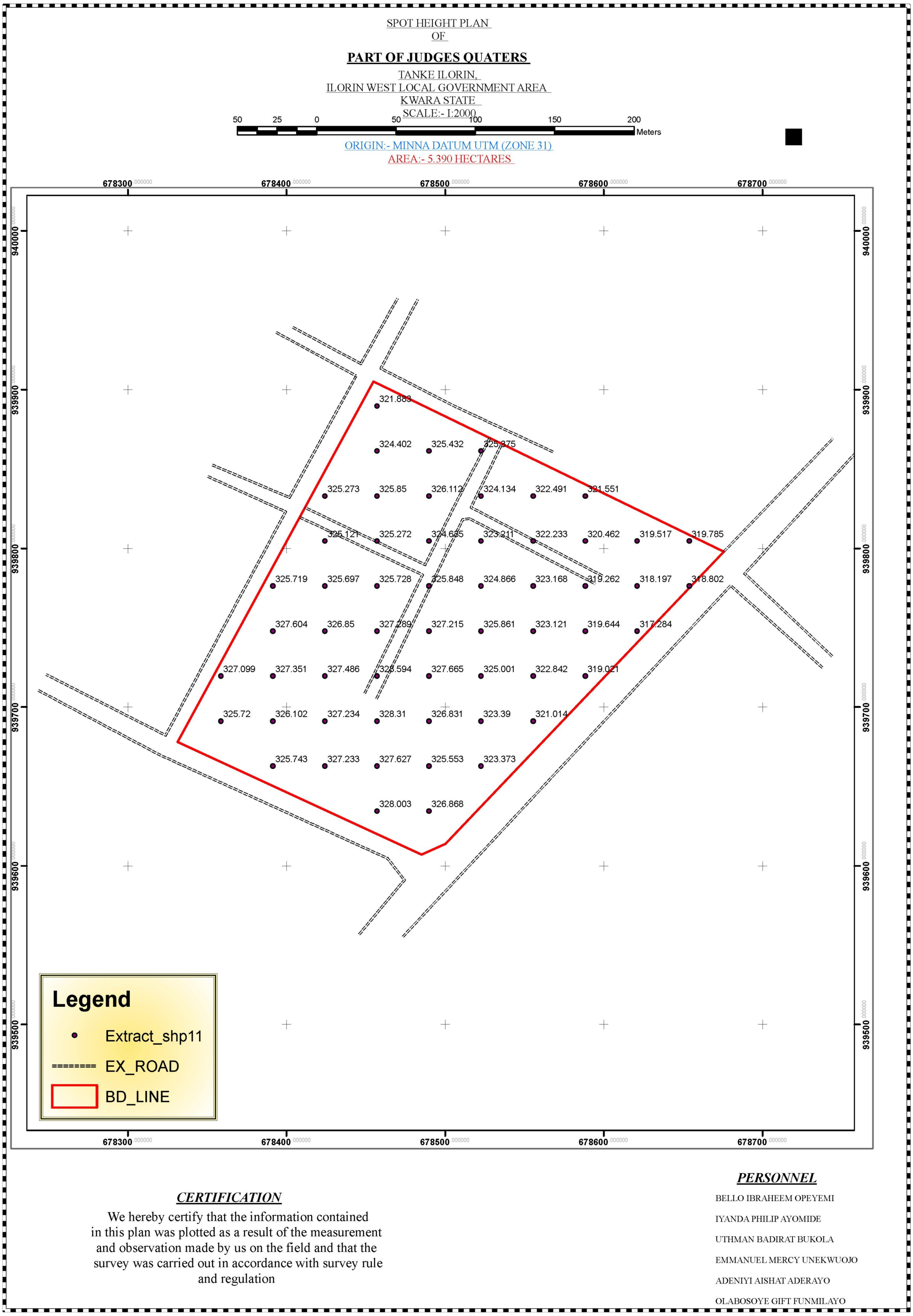
4.2.1 THE TOPOGRAPHIC PLAN (COMPOSITE PLAN)



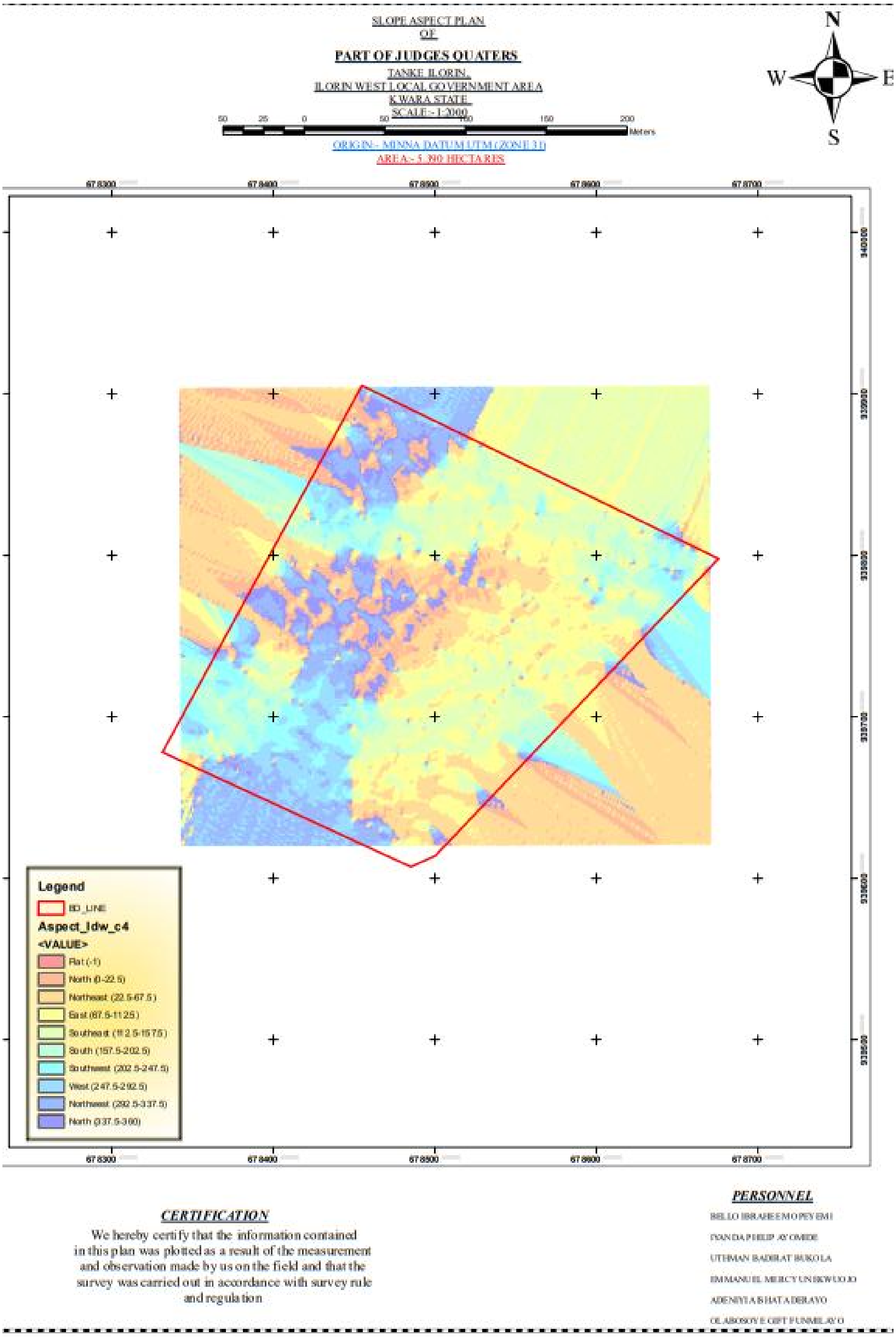
4.2.2 THE PERIMETER PLAN



4.2.3 THE SPOT HEIGHT PLAN



4.2.4 THE SLOPE ASPECT PLAN



CHAPTER FIVE

COSTING, SUMMARY, PROBLEM ENCOUNTERED, CONCLUSION AND RECOMMENDATIONS

5.1 COST ESTIMATION

This stage the total cost spent on the project from day one to the final stage.

Table 5.1.1: Direct cost parameters

S/N	DIRECT COST		
1	**Reconnaissance (1 day)**		
	PERSONNEL	**Rate**	**Total Amount (₦:K)**
	1 x surveyor	10500	10500
	1 x assistant surveyor	7500	7500
	1 x technical officer	6500	6500
	3 x skilled labour	4000	12000
	basic equipment	5000	5000:00
	transportation (vehicle, Driver and fuel)	10000	10000:00
		sub-total	**51,500**
2	**Monumentation (1 day)**		
	PERSONNEL		
	1 x assistant surveyor	7500	7500
	1 skilled labour	4000	4000
	transportation (vehicle, Driver and fuel)	10000	10000
	basic equipment	5000	5000:00

	Beacon (6)	1000	6000
		sub-total	**32,500**
3	**Data acquisition (2 days)**		
	PERSONNEL		
	1 x assistant surveyor	7500	7500
	1 x technical officer	6500	6500
	3 x skilled labour	4000	12000
	Total Station and accessories	15000	15000
	transportation (vehicle, Driver and fuel)	10000	10000
		sub-total	**51,000**
5	**Data Processing (2 days)**		
	PERSONNEL		
	1 x surveyor	10500	10500
	1 x assistant surveyor	7500	7500
	1 x technical officer	6500	6500
	computer / accessories	15000	15000
		sub-total	**39,500**
7	**Technical Report (1 day)**		
	PERSONNEL		
	1 x surveyor	10500	10500
	1 x assistant surveyor	7500	7500

	1 x secretary	5000	5000:00
	computer / accessories	15000	15000:00
		sub-total	**38,000**

TOTAL (DIRECT COST) 212,500 MOBILIZATION/DEMOBILIZATION = 5% of Direct Cost

= 0.05 × 212,500

= **₦10,625**

CONTINGENCY ALLOWANCE

= 5% of Direct Cost

= 0.05 × 212,500

= **₦10,225**

GRAND TOTAL = ₦212,500 + ₦10,625 + ₦10,625

= ₦233,750

VAT (@5% GRAND TOTAL) = 0.05 × 233750

= **₦11,687.5**

TOTAL COST PAYABLE = GRAND TOTAL + VAT

= ₦233,750+ ₦11,687.5

= ₦245,437.5

5.2 SUMMARY

The main aim of the project is to carry out the topographical information system of Judges Quarter Estate, Taoheed Road Ilorin. Kwara State. It was done in accordance with the survey rule and regulation and the departmental instruction. A digital ground survey method was basically use for data acquisition. A data base was created to house all the relevant data collected on the field, AutoCAD, suffer Microsoft word, Microsoft Excel and Notepad were combined to carryout data processing manipulation, Analysis and retriever. The final presentation of information was produced in form of digital map both in hard copy/soft copy.

5.3 PROBLEMS ENCOUNTERED

During the execution of this project the problem encountered are the followings:

1. The pegs used for monumentation were removed repeatedly, but this was overcome by referencing each peg to a fixed mark with the distance of the peg from the reference mark noted.

5.4 CONCLUSION

The aims of the project were achieved as the expected accuracy and the obtained results conformed to required accuracy of a third order job also the task actually exposed and broadened my knowledge on the scope, concepts and skills, involved in topographical surveying, more so, the project has been successfully executed as adequate data were acquired processed and represented in plans.

This project was interesting in spite of the numerous problems encounter thought the execution of the project.

The exercise was not an easy task, it is much cumbersome. It consume money, energy, time and other tangible factors, but at the end of it, I realize that it had helped me in the practical aspect of land surveying and exposed me to that types of problem. Surveyors usually encounters on the field.

5.4 RECOMMENDATIONS

Having successfully carried out the project assignment, I hereby recommend that.

1. The x, y and z coordinates of the features were which confirm the position of the features
2. The topographical surveys of the area enhanced the use of various surveys of software's such as AutoCAD; suffer e.t.c and the preparation of plan. Hence it is highly recommended for further studies.
3. The authority should make modern instrument like global positioning system (GPS) receiver, total station, and digital level etc. available to the prospective student of Higher National Diploma so as to be widely exposed to them for easy operation.
4. I also recommend that instrument should be released to the student on time for quick execution of the project.

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APPENDIX I

S/N	X	Y	Z
PT1	678457.2303	939634.3698	328.003
PT2	678490.0255	939634.3698	326.868
PT3	678391.6401	939662.7202	325.743
PT4	678424.4352	939662.7202	327.233
PT5	678457.2303	939662.7202	327.627
PT6	678490.0255	939662.7202	325.553
PT7	678522.8206	939662.7202	323.373
PT8	678358.8449	939691.0705	325.72
PT9	678391.6401	939691.0705	326.102
PT10	678424.4352	939691.0705	327.234
PT11	678457.2303	939691.0705	328.31
PT12	678490.0255	939691.0705	326.831
PT13	678522.8206	939691.0705	323.39
PT14	678555.6158	939691.0705	321.014
PT15	678358.8449	939719.4209	327.099
PT16	678391.6401	939719.4209	327.351
PT17	678424.4352	939719.4209	327.486
PT18	678457.2303	939719.4209	328.594
PT19	678490.0255	939719.4209	327.665
PT20	678522.8206	939719.4209	325.001
PT21	678555.6158	939719.4209	322.842

PT22	678588.4109	939719.4209	319.021
PT23	678391.6401	939747.7712	327.604
PT24	678424.4352	939747.7712	326.85
PT25	678457.2303	939747.7712	327.289
PT26	678490.0255	939747.7712	327.215
PT27	678522.8206	939747.7712	325.861
PT28	678555.6158	939747.7712	323.121
PT29	678588.4109	939747.7712	319.644
PT30	678621.206	939747.7712	317.284
PT31	678391.6401	939776.1216	325.719
PT32	678424.4352	939776.1216	325.697
PT33	678457.2303	939776.1216	325.728
PT34	678490.0255	939776.1216	325.848
PT35	678522.8206	939776.1216	324.866
PT36	678555.6158	939776.1216	323.168
PT37	678588.4109	939776.1216	319.262
PT38	678621.206	939776.1216	318.197
PT39	678654.0012	939776.1216	318.802
PT40	678424.4352	939804.4719	325.121
PT41	678457.2303	939804.4719	325.272
PT42	678490.0255	939804.4719	324.635
PT43	678522.8206	939804.4719	323.211
PT44	678555.6158	939804.4719	322.233

PT45	678588.4109	939804.4719	320.462
PT46	678621.206	939804.4719	319.517
PT47	678654.0012	939804.4719	319.785
PT48	678424.4352	939832.8223	325.273
PT49	678457.2303	939832.8223	325.85
PT50	678490.0255	939832.8223	326.112
PT51	678522.8206	939832.8223	324.134
PT52	678555.6158	939832.8223	322.491
PT53	678588.4109	939832.8223	321.551
PT54	678457.2303	939861.1726	324.402
PT55	678490.0255	939861.1726	325.432
PT56	678522.8206	939861.1726	325.375
PT57	678457.2303	939889.523	321.883