PROJECT REPORT

ON

ROUTE SURVEY OF MANDALA TO AWE , MORO LOCAL GOVERNMENT AREA, ILORIN, KWARA STATE

BY:
ADEDEWE VIVIAN ODUNAYO
HND/23/SGI/FT/0115

BEING A RESEARCH PROJECT SUBMITTED TO THE

DEPARTMENT OF SURVEYING AND GEO-INFORMATICS

INSTITUTE OF ENVIRONMENTAL STUDIES

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

JUNE 2025

CERTIFICATE

I hereby certify that all the information contained in this project report was obtained as a result of the observations and measurements made by me on the field and that the survey was executed in accordance with survey rules, regulations and departmental instructions.

……………….………………………….

ADEDEWE VIVIAN ODUNAYO

DATE ………………………………

<u>**CERTIFICATION**</u>

This is to certify that **ADEDEWE VIVIAN ODUNAYO** with Matric No **HND/23/SGI/FT/0115** has satisfactorily carried out the survey duties contained in this project report under my instructions and direct supervision.

I hereby declare that he has conducted herself with the due diligence, honesty and sobriety on the said duties.

…. …………………………………… **DATE: …………………………**

SURV. R.O ASHONIBARE

(SUPERVISOR)

…. …………………………………… **DATE: …………………………**

MR. ISAU IBRAHIM ABIMBOLA

(H.O.D)

…. …………………………………… **DATE: …………………………**

SURV. R. AWOLEYE

(PROJECT COORDINATOR)

………………………………………. **DATE: …………………………**

EXTERNAL SUPERVISOR

DEDICATION

This project is dedicated to God Almighty and to my Parents **MR. AND MRS. ADEDEWE.**

ACKNOWLEDGEMENTS

To God be the glory, I owe God a lot for the preservation of my life throughout my stay in school. Also, I thank him for the success of this program.

Special thanks to my supervisor **SURV.R.O ASHONIBARE** by explaining every aspect of the project and write ups. I also thank him for his encouragement, recommendation and full support towards the success of this project. To all the department Lecturers, I say thank a very big thanks for your fatherly advice and support sir.

Also, my Special thanks goes to the head Of department **SURVEYING AND GEO-INFORMATICS** of Kwara State Polytechnic in Person of **MR.ISAU ABIMBOLA** and also to the director of Consultancy of Kwara State Polytechnic in person of **SURV. A.G AREMU, SURV. R.S AWOLEYE, SURV. ABDULSALAM AYUBA, SURV. KABIR, SURV. FELIX DIRAN AND SURV. KAZEEM** all my Lecturers who directly or indirectly guided me to Successfully Complete my Higher National Diploma Programme.

My appreciation goes to all my friends whom I will mention few of them **MARY, ESTHER, OLAITAN, ALICE, DAMILOLA, NAOMI, FEMI, ZUGLOOL** and **SAMMUEL,** and to my one and only love **OLATUNDE SHOREMI.**

My sincere appreciation goes to one and my only loving and caring mummy **MADAM BISTOLAD, MUMMY OBINA, MUMMY TOYIN, MUMMY MARY** and the entire family members for their concern and generosity throughout my stay in school, May Almighty God reward you all.

To my priceless jewel, my Hero and my irreplaceable.

Also, I want to extend my gratefulness to my group members for their endurance and mutual understanding. I thank all my course mates as well, for their understanding throughout the course.

ADEDEWE VIVIAN ODUNAYO

JUNE 2025

ABSTRACT

This project was centred on route survey, design and volume computation of Mandala to Awe village Moro Local Government Area Ilorin Kwara state, Nigeria. The project was executed in order to provide relevant information on the route for construction purpose. The survey operations was carried out to achieve the aim; which included reconnaissance, marking of chainage distance, establishment of controls and data capture(geometric and attribute) along the route using a single frequency South Galaxy G1 (GNSS receiver), Together with Topcon (ES-103) total station. The final coordinates were used to produce detail, a profile and cross-section plan, the designing of the route was also done and the volume of earthwork for cut and fill was calculated. Lastly, plans showing the aforementioned drawings were produced in softcopy and hardcopy formats after which a comprehensive technical report was written on the executed project. I hereby recommend that the survey information obtained as well as the route design carried out in the course of this project execution should be used in the construction and rehabilitation of the said route.

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CHAPTER ONE

1.0 INTRODUCTION

1.1 BACKGROUND TO THE STUDY

Engineering Surveying is one of the branches of surveying which from the general express for any survey work carried out in connection with construction engineering and building project, it is a large scale topographical map survey which the basis for design of engineering works such as highways, railways, canals, tunnels, dams, pipelines and transmission lines.

In the word of engineering and environmental studies, surveying has been recognized as the inevitable operation been described as be the bedrock of every meaningful development. The greater part of its responsibility is seen from the various types of surveying which are all geared toward promoting route ways, convenience, accessibility and spatial declination of both natural and social environment. In addition, surveying means the activities of planning, designing, constructions, development and rehabilitation of roads, depending on the survey data required by the surveyor.

Route survey which is an aspect of engineering survey may be defined as the survey operation that is done for the establishment of the horizontal and vertical alignment of transportation facilities. It involved: planning, design and setting out of any route such as railways, highways, pipelines and canals etc. as obtained by a surveyor and it also involved the proper assessment of natural and man-made features.

In addition, this type of survey should be applied when there is need for alignment, expansion, or rehabilitation at any existing route (road) e.g. for traffic purposes. The reason is that route survey provides a plan/map that shows the alignment, details, profile and cross sectional leveling which depicts the nature of the terrain of a given strip of land which serves the purpose of location, design and construction of route networks.

Good road network is one of the basic amenities needed by human being as movement is one of the characteristics of living things. There are needs for people to move from one place to the other and transportation of goods and services. Therefore for any meaningful development in a country, good road is a must.

1.2 SIGNIFICANT OF THE PROJECT

It was discovered that the route from Mandala to Awe village moro Local government Ilorin, Kwara State, had been badly eroded and full of potholes; also, the road is found to be too narrow and needed to be extended considering the volume of traffic plying the road. Rehabilitation of this road should be carried out in other to increase its carrying capacity thereby increase the physical development and human activities therein. Due to these, certain information about the road must be acquired which calls for route survey so as to get the baseline data necessary for the road design.

The main aim of this project is:

To carry-out Route Survey of Mandala to Awe Village road in Moro local government area, Ilorin, Kwara State

1.3 AIM(S) AND OBJECTIVES

1.3.2 OBJECTIVES

In actualization of the said aim of the project, the following objectives

Were followed sequentially:

i. Reconnaissance which include office planning and field reconnaissance.

ii. Identification of existing features and adjoining roads.

iii. Stability of the ground controls to be use for orientation.

iv. Determination of centre line and marking of chainages along the centre line at an interval of 25m.

v. Marking out some selected points for the cross-sectioning at intervals of 8m, 4m to the right and left on the profile and also the edges of drainage was marked.

vi. Leveling to determine the height of some selected points along the road.

vii. Detailing by the use of Topcon (ES-103) total station

viii. Plan production (graphical representation of the horizontal, vertical and cross sections) drawn with appropriate scale.

ix. Reports write up.

1.4 PROJECT SPECIFICATIONS

The following are the specification to be ascertained in the project:

Traverse must commence on two coordinated (known) controls and closed on another set of two coordinated controls which must be confirmed undisturbed by necessary measurement (control checks).

Establishing traverse points by using pegs together with nails and bottle corks.

Spirit leveling must commence on a known benchmark and closed back on another known benchmark. Formulae for its misclosure are $\pm 24mm\sqrt{k}$, where ‘k’ is the total distance covered in kilometers.

Leveling must be observed at every 25m intervals on the centre line and at 6.50m intervals on both sides of the centre line for the cross sectioning. Edges of drainage at both sides should be heightened.

Fixing of relevant features to enhance assessment and necessary composition for good interpretation of plan.

Setting out curve by using Total Station (Topcon ES-103). within third other survey.

The accuracy of the project must fall within the order of the project.

1.5 SCOPE OF THE PROJECT

The entire project covered the following:-

Reconnaissance (both office planning and field reconnaissance).

1. Data acquisition:

(a) Selection of stations.

(b) Traverse angular observation and data recording.

(c) Linear measurement with the aid of Dumpy Level.

(d) Topcon TotalStation for traverse centre line and adjacent sides (longitudinal or profile and cross sectioning).

(e) Fixing of details by tacheometry method.

(iii)Computations to determine:

(a) Horizontal coordinates (i.e. x and y coordinates)

(b) Vertical coordinates (i.e. z coordinates) by level reduction.

(c) Setting out angles and distance for the curve.

2. Data analysis i.e. comparing result obtained with the required accuracy.

3. Data presentation :

(a) Production of horizontal alignment (i.e. plan showing existing features and the propose route).

(b) Production of longitudinal section plan

(c) Production of cross section plan

(d) Project report writing: - This involves writing of detail report in connection with entire project done in conformity with the outline given by the project supervisor.

1.6 *PERSONNEL*

The underlisted students of HND II 2024/2025 set are the personnel that participated in the execution of this project. They are:

ADEDEWE VIVIAN ODUNAYO **HND/23/SGI/FT/0115**
(WRITTER)

PIUS RACHEAL NAOMI	HND/23/SGI/FT/0087
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ADEDEWE VIVIAN ODUNAYO	HND/23/SGI/FT/0115
YAKIN RAUF OLUWAFEMI	HND/22/SGI/FT/0118

1.7 PROJECT AREA

The project site is the route of Mandala to Awe Village Moro Local Government Area Ilorin Kwara State. It cover approximately 3.5km extent of land. With geographical coordinates of :

Long. 004°28’07”

Lat. 008°32’55”

Long. 004°28’07”

Lat. 008°32’55”

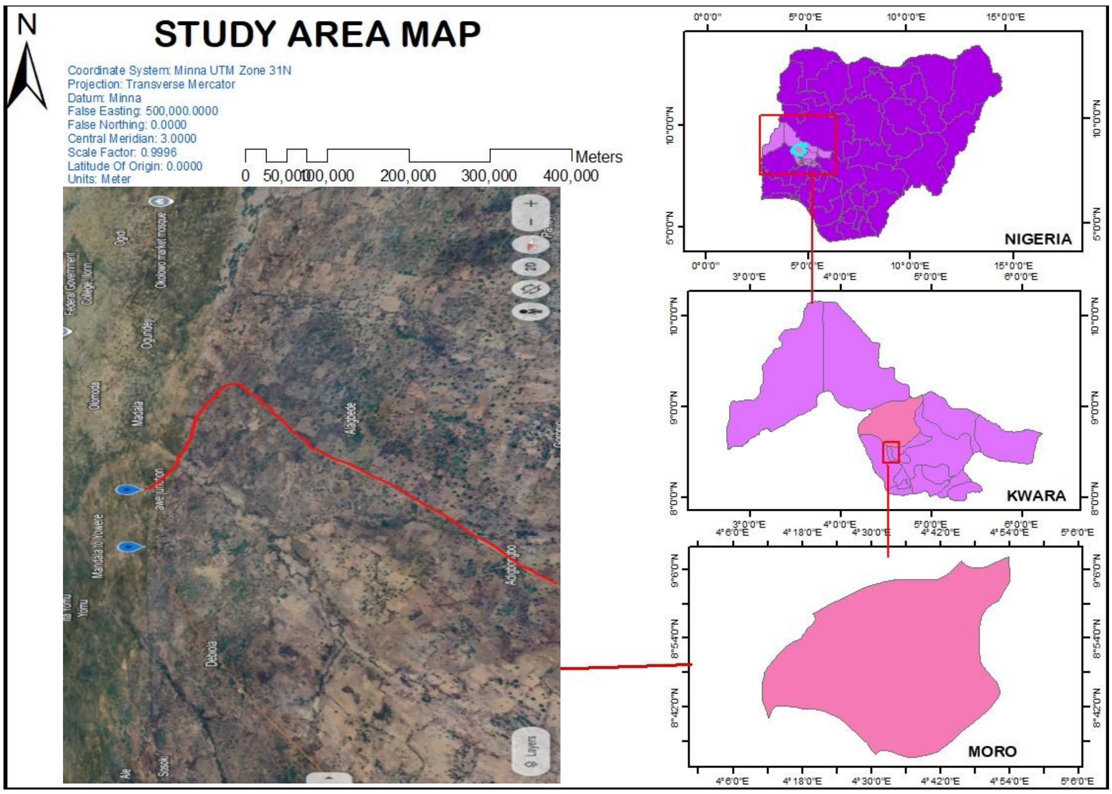


Fig 1.1: Study Area

Source:-GoogleEarth

CHAPTER TWO

2.0 LITERATURE PREVIEW

Transportation is the movement of people and goods from one location to another. Throughout history, the economic wealth and military power of a people or a nation have been closely tied to efficient methods of transportation. Transportation provides access to natural resources and promotes trade, allowing a nation to accumulate wealth and power.

Transportation is vital to a nation’s economy. Reducing the costs of transporting natural resources to production sites and moving finished goods to markets is one of the key factors in economic competition

Transportation systems and the routes being used have greatly influenced both how and where people live. The route of the transportation system could be inland waterways, air, road, railway, tunnel, etc. Before transportation can come into existence, adequate documentation of the route through spatial information cannot be underestimated during the planning stage.

Surveying is very important for planning and as well for acquisition of the required data for route alignment, with special attention on road network, for rehabilitation and construction of roads.

Route Surveying is such a survey exercise that requires all field works and calculations made for the purpose of locating and constructing a cross country social utilities such as highways, railways, canals, transmission lines and pipelines. This involves the determination of the ground configuration and location of physical features (naturals and man-made) along the route, establishing the line on the ground and computing the volume of earthwork.

The main purpose of any route survey is to:

i. Select one or more tentative general route for the roadway or utility

ii. Gather enough information about the general route to make it possible for the route designers to select the final location of the route, and
iii. Mark this final location selected from the available options.

With these purpose, route survey usually entails reconnaissance, preliminary and final-location survey phases that satisfy respectively, each of the purposes given above. Sometimes, the prevailing circumstances may preclude the requirement to perform all three phases; for example if a new road or utility line is to be constructed on a military installation, having a well-marked vertical and horizontal control networks and up-to-date topographic maps and utility maps, then the reconnaissance and preliminary survey phases may not necessarily be required.

Maury (1969) explained route surveying as the constructional processes and procedures involved in the production and the design of a route, such as roads, pipelines, railways and transmission lines. Hence, the improvement in the economy has constituted tremendous increase in population of vehicles, advancement in construction technology, trained professionals and emergence of caterpillars. Therefore, it becomes necessary to contract safer and more comfortable and serviceable roads.

Punmia (2005) explained route surveying in one of his quotations as surveys along a comparatively narrow strip of territory for the location, design and construction of any route of transportation, such as highways and railroads, aqueducts, canals and flumes, pipeline for water, sewage, oil and gas, cableways, belt conveyors and power, telephone and telegraph transmission line is called **'ROUTE SURVEY'.** At this stage, it must be noted that the examples mentioned above cannot design themselves until some methods are used to make them refined.

It is worthy to note the construction of roads in Nigeria dated back to decades ago or during colonial era; roads are commonly found narrow till now, few are found serviceably and their horizontal and vertical alignment are much influenced by their topography. The road construction was then constrained by non-availability of earth moving equipment, limited funds, no skillful personnel and fewer numbers of vehicles on roads.

Anderson and Mikhail (1985) said that; route survey as well as topographical and construction surveys are necessary for location and construction of transportation lines such as highways, railways, canals, transmission lines and pipelines.

The execution of route survey entails four (4) basic processes as far as data acquisition is concerned. These could be outlined as follows;

i. Traversing
ii. Leveling
iii. Detailing
iv. Curve designation

Traversing as defined by Ramsey (1977), is the establishment of point on the earth surface by determining its bearing and distance from another known point. Also, traversing consists of measurement of angles between successive lines (or bearing of each line) and length of each line, giving the coordinate of the first station, the bearing of the first line, and the coordinates of all successive point can be calculated.

Allan (1980) described traversing as the determination of length and direction of line between points in a sequential order on the earth surface in order to establish the position of point. It has a series of control points (stations) each one been intervisible with its adjacent station chosen to fulfill the demand of the survey, the line joining the stations being traverse has series of connected straight lines whose lengths and directions have been determined.

Basak (2000), defined leveling as the art of determining the relatives vertical height of different points on the surface of the earth, therefore in leveling, the measurement are taken only in vertical plane. The newly determined heights of points are referenced to a predetermined datum of known height.

Clark (1977) explained profile leveling as term used to describe the fieldwork involved in surveying, a longitudinal section of route to be surveyed; the profile leveling may be at regular interval such as 25m or 30m which would be a continuous process until the closing station is reached. Clark also explained that cross-section leveling is the level run to determine the height of points on both sides of the centre line.

There are various methods by which details could be fixed in surveying, these are:

i. Tachometry method
ii. Chain survey method
iii. Plane table survey method
iv. Compass survey method

Vincent Tao (2000), stressed that "the construction of a highway route could be done using mobile mapping system which involves mounting more than one camera on a mobile platform". Thus, from the explanations above, it can be inferred that the survey of a long route centre will be more easily done with the use of advanced techniques e.g. remote sensing and photogrammetric method.

More so, certain procedures or method are used when carrying out a route survey explained by Basak (1994) that when the question of constructing a new road for public demand or some strategic reasons arises, the procedures to be taken are:

i. To find the necessity for the existence of the road
ii. The marking of the tentative alignment
iii. The reconnaissance survey
iv. Preliminary location survey traverse
v. Final location survey and report

He further explained that the tentative alignments are marked on the general map and contour map and contour map of the area through which the route is expected to pass.

Meanwhile, in every construction work, the surveyor stands to perform certain roles and also must be familiar with some procedures of the work at hand as at the time of execution.

In view of the foregoing, Anderson (1985) stressed that "In order to plan and perform, the surveyors needed to acquire the data of a route survey and the surveyor must be familiar with the following:

i. The geometry of horizontal and vertical control and how they are used in the route alignment procedure.

ii. The methods of acquiring terrain data utilized in route design.
iii. The procedures followed in processing terrain data to obtain earth work volumes
iv. Establishment on the ground, a system of staves both in plane and elevation, from which measurement of earth work and structures can be taken conveniently by the construction force
v. Giving lines and grades as needed either to replace stakes disturbed by construction or to reach additional points on the structure itself.
vi. Making measurements necessary to verify the location of completed part of the structure as-built survey.

In addition to the above, the surveyor in concern must also learn or be familiar with the reasoning and interpretation of maps, the symbols and signs, scales, directive, locations etc. certain parameters therefore are necessary to explain routes e.g. cross section, longitudinal sections, curves and setting out etc.

Duggal (2006) defined curves as arcs with some finite radius, provided between intersecting straights to gradually negotiate a change in direction. He classified as horizontal or vertical curves, the former being in the horizontal plane and the latter in the vertical plane.

According to a U.S based website homepage, circular curves are used to join intersecting straight lines (or tangents), they are usually assumed to be concave. It was explained that horizontal curves are classified into four (3) major types i.e. simple curve, compound curve and reverse curve.

Furthermore, it was explained that laying out circular curves must follow the following procedures.

i. Select tangents and general curves making sure you meet minimum radius criteria.
ii. Select specific radii spiral and calculate important points using formulae or table, those needed for design, plans and lab requirements.
iii. Station alignment as curves are encountered
iv. Determine super and runoff for curves and put in table.

More so, he further stressed that the elements of a circular curve are point of intersection, tangent, point of curve, point of tangent, radius, long chord, external ordinate, internal ordinate, curve length, and the apex angle. He also said that a curve may be designated either by its radius or degree of curve.

In his quest to explain the methods of setting out of circular curves, he said that the various linear methods of setting out a simple circular curve are;

i. Offsets from the long chord
ii. Perpendicular offsets from the tangents
iii. Radial offsets from the tangent
iv. Successive bisection of arcs
v. Offsets from the chord produced

He also said that the angular methods are:

Rankine method of deflection angle, one Theodolite method

i. Two Theodolite method
ii. Tachometric method

In the laying out of simple curves, some obstacles are usually encountered, on this note; Duggal (2006) explained that the obstacles in laying out simple curves are:

i. When the complete curve cannot be set out from point of curves i.e. obstruction to vision
ii. Obstacles to chaining
iii. When the point of intersection is inaccessible

He explained that a compound curve is a combination of two or more simple circular curves with different radii**.**

According to The Transit, New Zealand State Highway Geometric Design Manual May, 2005. A horizontal road alignment is a usually series of straights (tangents) and circular curves. Transition curves are often used to join straight sections smoothly into circular curve sections.

A curve should normally be used whenever there is a change of direction in a road alignment and must be of sufficient length to avoid the appearance of a kink in the road alignment.

Small changes in alignment are not usually noticed by drivers and in some cases it might not be necessary to provide a curve between adjacent straight tangent sections of road, provided they do not produce a kinked road alignment.

Horizontal road alignments without significant straight sections are described as curvilinear. A curvilinear alignment normally has:

i. long, large radius circular curves, with or without spiral transitions, and
ii. Occasionally, other types of curves which conform to polynomial mathematical relationships.

Curvilinear alignment is most suited to dual carriageway roads but can also be successfully used on two-lane roads in flat and undulating terrain, providing overtaking provisions are not impaired. The horizontal curves of a curvilinear alignment are generally of large radius and:

i. do not normally restrict overtaking opportunities,
ii. help reduce headlight glare, and give drivers a better perception of the speed of approach of opposing vehicles.

Makanjuola (1998) in his write up said principally because of employment opportunities, there have been a continued migration of people from the rural areas to the big urban centers, the result of this is higher road traffic and congestion. This is a very big factor causing most highways route reconstructions.

Asere (1998) also said that the situation of roads today indicate that while the construction of roads were conceived, vital parameters in the final execution of the roads were not taken into account.

He further explained that "the use of multiple culverts instead of bridges in areas of heavy rainfall is very inappropriate, construction of specific bridges in place of washed culverts are suggested to minimized or stop the reoccurrence of the type of disaster witnessed on these roads".

2.2 CONCEPT OF ROUTE SURVEYING

Route surveying refers to the process of determining the most suitable path for constructing transportation infrastructure. It involves detailed fieldwork, data acquisition, and computation of earthwork volumes to ensure safe, efficient, and cost-effective road alignments (Maury, 1969). According to Punmia (2005), route surveying is conducted along a narrow strip of land to define the horizontal and vertical alignment of highways, pipelines, and other linear infrastructure projects.

The primary objectives of route surveying include:

- Selecting the most feasible route for the transportation project.
- Gathering sufficient topographical and spatial data to aid in design and construction.
- Establishing control points, profiles, and alignments for accurate execution of the project.

The execution of a route survey typically involves reconnaissance, preliminary survey, and final location survey. Each stage is crucial for ensuring the accuracy and feasibility of the project (Anderson & Mikhail, 1985).

2.3 CHALLENGES IN ROUTE SURVEYING

Despite advancements in surveying technology, several challenges affect route surveying and road construction, particularly in developing countries like Nigeria. These include:

- Poor road planning: Many roads are designed without adequate consideration of topography and environmental factors (Asere, 1998).
- Inadequate equipment: Limited access to modern surveying tools such as GPS, drones, and GIS affects accuracy.
- Lack of skilled personnel: Shortage of trained surveyors and engineers leads to inefficiencies in route alignment and construction.
- Environmental constraints: Swamps, mountains, and water bodies pose significant challenges in route selection and construction.

2.4 MODERN TECHNIQUES IN ROUTE SURVEYING

Technological advancements have improved the efficiency and accuracy of route surveying. These include:

- GPS and GIS Mapping: Provides high-precision location data for route alignment.
- Remote Sensing and Drones: Enables quick data collection over large areas.
- Mobile Mapping Systems: Uses cameras and sensors to capture real-time spatial data for highway design (Vincent Tao, 2000).

2.5 HOW THIS STUDY INTEND TO ACHIEVE ITS AIM

To achieve the objectives of this project, the following approach will be adopted:

1. Data Collection:

- Conduct field surveys using Total Station and GPS for accurate data acquisition.
- Utilize GIS software for spatial analysis and mapping of the proposed route.
- Perform leveling and detailing to determine terrain features and elevation profiles.

2. Data Analysis:

- Process collected data using AutoCAD Civil 3D and GIS tools for route alignment design.
- Apply mathematical models to compute earthwork volumes and curve parameters.

3. Route Selection and Design:

- Evaluate multiple route options based on topography, environmental factors, and economic feasibility.
- Design the final route alignment, incorporating safety measures and engineering standards.

4. Validation and Recommendations:

- Compare results with existing road networks to assess accuracy.
- Provide recommendations for improving route surveying methodologies in Nigeria.

2.6 CONTRIBUTION OF THIS STUDY TO LITERATURE.

i. This study contributes to existing knowledge by:

ii. Evaluating the effectiveness of modern surveying techniques in route alignment.

iii. Identifying the challenges associated with traditional route surveying methods.

iv. Proposing improved methodologies for accurate and cost-effective route surveying.

v. Providing a case study on route surveying applications in Nigeria's transportation sector.

2.7 CONCLUTION

This chapter has reviewed the principles, methods, and challenges of route surveying, as well as advancements in modern techniques. The study aims to apply these concepts to improve route alignment and road construction efficiency. By integrating traditional surveying methods with modern technologies, this research will contribute to more effective and sustainable transportation planning.

This revised version includes:

A clearer structure with subheadings for readability.

Your study's contribution to literature.

A detailed explanation of how you intend to achieve the project's aim.

CHAPTER THREE

3.0 METHODOLOGY

Methodology comprises of the method and procedure employed in executing the project both in office and on the field. The method adopted for this project was based on the principle of surveying which was working from whole to part, aim at acquiring reliable and accurate data needed for the computation and presentation of information in form of a plan.

The procedure adopted in carrying out the project followed a pattern in which one step leads to another, for easy execution and for the aims and objectives of the project to be realized, it was planned as under listed;

I. Reconnaissance survey
II. Chainage marking
III. Control establishment
IV. Data acquisition
V. Data downloading and processing
VI. Data analysis
VII. Road design
VIII. Information presentation

3.1 RECONNAISSANCE

This is a very important aspect of surveying that involves planning and preliminary inspection of the area before the commencement of the actual data acquisition of the project site, this is done for the purpose of planning on how to execute the project, fixing stations, locating controls etc. its importance to the actual survey operation that cannot be underestimated as it enable it to give the best method to carry out the task.

The two phases of reconnaissance are;

I. Office planning
II. Field reconnaissance

3.1.1 OFFICE RECONNAISANCE

This involved the office work carried out before the actual field work. This aspect involved the computation and study of the available information the project site as this helped in yielding result within the expected accuracy. It comprises of the following

I. Understanding the purpose of the survey from the project instructions.
II. Obtaining the specification for the accuracy required leading to the choice of a suitable scale.
III. Deciding the method to be employed for the measurement.
IV. The kind of instruments to be used in executing the project.

The coordinates of control stations around the project area were collected from the SOUTH GALAXY G1 (GNSS receiver).

Table 3.1 coordinates of the existing ground control used origin (U.T.M)

Control id	Easting (Nm)	Nothing (Nm)	Height (m)
BM1	661425.0232	945950.9002	324.7349
BM2	661402.8991	945939.4238	324.8356
BM3	661457.0369	945934.9219	324.0516

3.1.2 FIELD RECONNAISSANCE

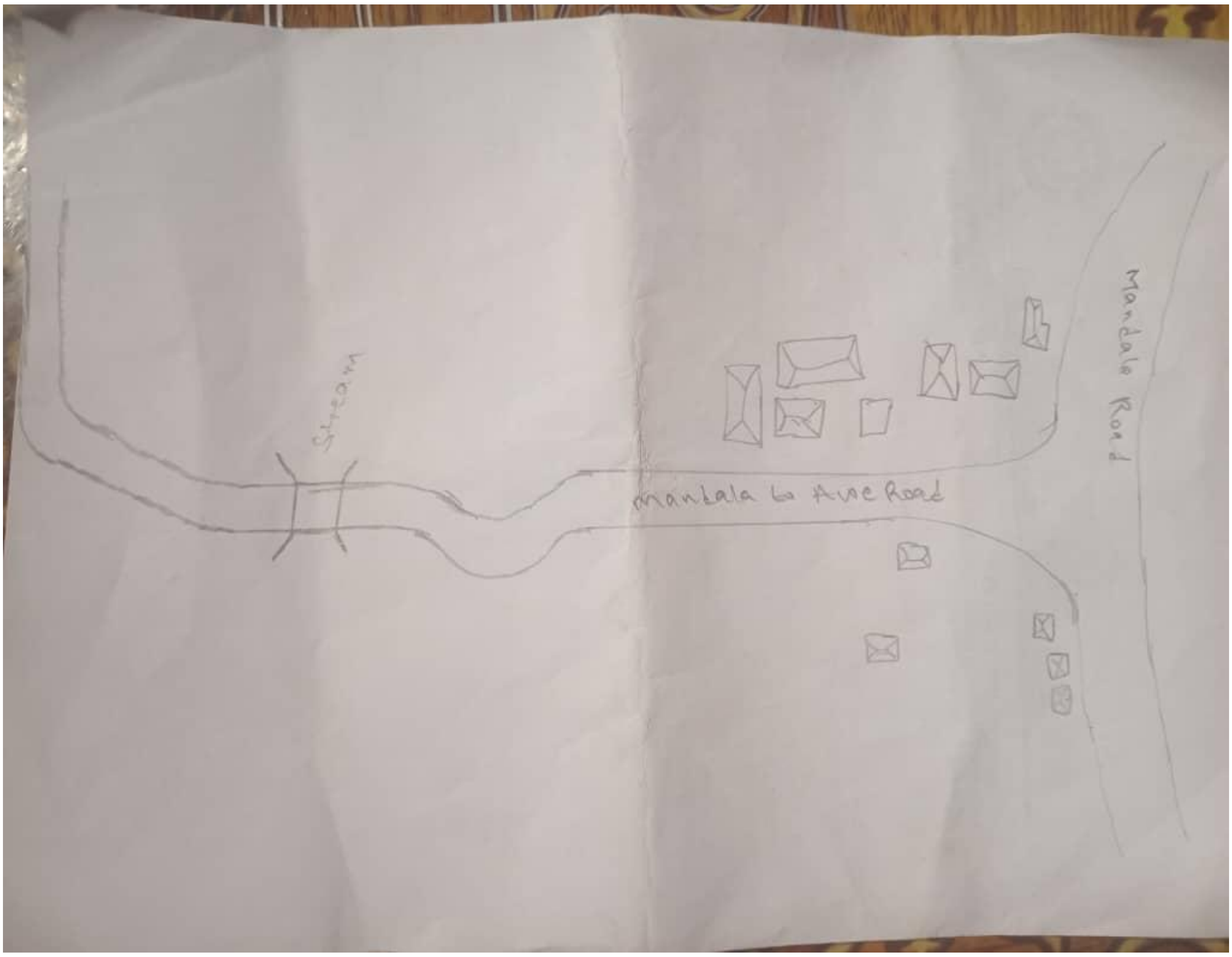
The field reconnaissance was done after the office planning it involved a visitation to the project site by all the group numbers to have a pre requisite knowledge of how it looks like and how the field operations would be carried out.

During the visit the control pillars planned to be used were located, traverse stations which were to form the traverse framework were selected and marked using pegs and nails, inter visibility between successive traverse station were ensured.

At the end of the visit, a sketch diagram known as "recce diagram" showing the physical appearance of the project site was drawn.

To sum up the reconnaissance facilitated the planning and execution of the actual survey as it was taking into consideration the possible problems that are likely to be encountered, how such problems can be overcome or reduced to the barest minimum.

Fig. 3.1.1 Field Recci diagram Mandala Via Awe to Adigongo Route.



3.2 A TYPICAL PEG USED

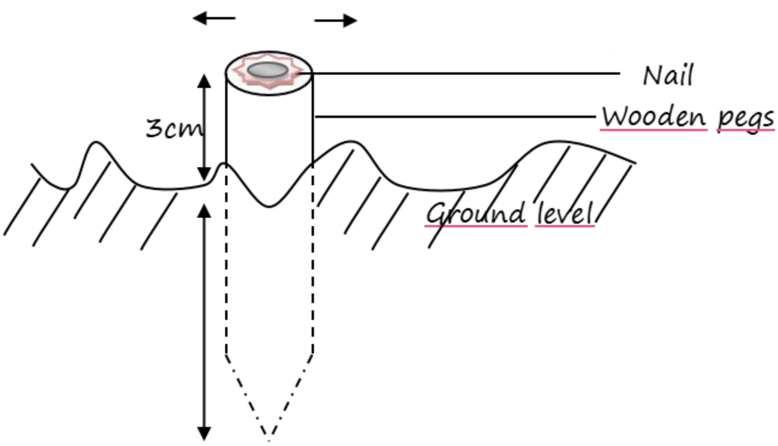


Fig 3.2 An Illustration diagram of peg

3.3 DATA ACQUISITION

This entails all activities involved in the collection of data for the successful execution of the project. This was carried out in chronological order using mode digital surveying equipment such that: they were coordinated using Topcon(ES-103) total station, the position of the center line was determined using Topcon(ES-103) total station and also both national and man-made features were observed and determined.

3.3.1 EQUIPMENT USED

I. Topcon (ES-103) total station
II. Tripod stand
III. S50mm steel tape
IV. 5m packet tape
V. Plumb pop
VI. Nails with crown corks
VII. Downloading cables
VIII. Writing materials

3.3.1.1 HARDWARE USED

The hardware used for this project includes.

I. Laptop computer for data processing
II. An Hp desk set for the printing of hard copy

3.3.1.2 SOFTWARE USED

I. Note pad
II. Microsoft excel 2010
III. Civil cad 2010
IV. Hp printer devices

3.3.2 CONTROL CHECK

The essence of carrying out the operation was to ascertain the reliability of all the controls used for the project whether they were in situ. The check was carried out by setting total station instrument on BM1 and all the necessary temporary station adjustment(i.e catering; leveling and focusing) was carried out, the reflector at back station on BM2 was then bisected, read and recorded, the instrument was turn to fore station BM3 and the reflector was also bisected read and recorded and on getting to every 500m interval where there are 2 benchmarks on the both side of the road same procedures where adopted in until the end of the road.

The coordinates obtained were compared with the coordinates extracted from the use of SOUTH GALAXY G1(GNSS receiver) which the result shows that the discrepancy was very little and lower than the allowable standard for the specification of this project which shows that BM1, BM2 and BM3project were reliable enough for the third order survey project given.

Table 3.3.2.1 showing the collected co-ordinates of the controls

STATION	EASTING (Nm)	NORTHING (Nm)	DISTANCE (M)	BEARING
BM1	661425.0232	945950.9002	324.7349	
BM2	661402.8991	945939.4238	324.8356	$179^0$14’ 9”
BM3	661457.0369	945934.9219	324.0516	$24^0$27’ 53”

Source: Supervisor (May 2025)

Table 3.3.2.2 showing the observed co-ordinates of the controls

STATION	EASTING (Nm)	NORTHING (Nm)	DISTANCE (M)	BEARING
BM1	661425.0232	945950.9002	324.7349	
BM2	661402.8991	945939.4238	324.8356	$179^0$14’ 9”
BM3	661457.0369	945934.9219	324.0516	$24^0$27’ 53”

The included angle = bearing of bm2 to bm1 minus bearing of bm2 to bm3

Table 3.3.2.3.showing the Comparison of observed and computed data

	Bearing	Back dist (m)
Computed value	179^0 14’ 09”	220.590
Observed value	24^0 27’ 53”	14.6427
Error	$00^0$01’ 06”	0.006

For the control points, the allowable heights misclosure were lesser than obtained misclosure for each control point. There, the set of controls (bm1, bm2and bm3) were in situ vertically and could be used as benchmark for height determination of profile and cross sectional points.

3.3.3 SELECTION OF STATION

The station selected were ensured to be inter visible to each other, accessible and firmly pegged to the ground with wooden pegs and bottle corks carrying mills at the centre point to denotes its exact point on the earth surface.

3.4 FIELD OBSERVATION

3.4.1 HORIZONTAL ALIGNMENT

This way carried out on loops with the aid of Topcon (ES-103) total station which has the capability to capture all the three dimensional (3d) terrain characteristics (easting, northing and height) concurrently. To control swing, the observation we carried out by commencing it on a set of controls and ending on another control from loops.

The instrument was set up on Bm2 and the reflector was placed on Bm1and the orientation was performed, the reflector was placed at change 0+000, which was the starting point of the route survey. The chainage 0+000 served as nail.

The target (reflector) was properly leveled and the coordinate of all the changes in the direction were observed and recorded in the internal memory of the instruments; other points which were visible from this instrument station were bisected and coordinated. This was done repeatedly until the entire section of the route was covered.

3.4.2 LONGITUDINAL / PROFILING

This was carried out with the aid of Topcon (ES-103) total station as well. The instrument was set on Bm2 and the reflector was placed on Bm1and the orientation was at every 25m interval. Whenever the target from the instrument station is too far and cannot be sighted from the instrument which might affect the accuracy of data, another stations were coordinated station where same procedures were repeated until all the data were captured.

CHAPTER FOUR

4.0 DATA PROCESSING AND RESULT ANALYSIS

4.1 DATA PROCESSING PROCEDURE

This is the process that follows downloading of data into the computer system. It is the manipulation of data into a more used form. Data processing includes numerical calculation, classification of data and the transmission of data from one place to another.

This stage involves downloading of the acquired data on field from the digital equipment (total station) to the personal computer for further processing.

The data obtained using Topcon(ES-103) total station were downloaded in sequential arrangement. After successful download and process using notepad for sorting them into desired arrangements.

The file was opened and point data were displayed. This was then copied to Microsoft excel environment for further processing.

On Microsoft excel, data were prepared for scripting purpose in AutoCad. A small program was written to prepare point and text scripts files.

The coordinates obtained were x,y,z format which were used for plotting the routes longitudinal profile and cross sections.

4.2 TOTAL STATION DATA PROCESSING

The downloaded data from the total station was further edited using Microsoft excel, the final copy was saved as text file containing x,y,z coordinates of all points observe in the field.

4.3 DATA EDITING

Data editing is done using the Microsoft excel. The following steps are followed to edit our data in the project:

i. The Microsoft excel was lunched.

ii. Click on file, the click on “all file” and select the group data.
iii. On open “test import wizard”, select “delimitated” and click on next.
iv. Select comma, tap and space then click on next. All the co-ordinates will be arranged then click on finish.

Cut and copy and put them in its appropriate positions if there is any misclosure.

4.4 DESIGN AND VOLUME CALCULATIONS

The design of the route was done after the creation of the longitudinal profile. The longitudinal profile was created using AutoCAD Civil 2012. The steps in the creation of the longitudinal profile are as follows:

1. The Centerlines of the entire data is first extracted and arranged in Microsoft Excel and saved with the extension txt.
2. The AutoCAD Civil 2012 Software is launched.
3. A new project is created and named
4. The Units icon is clicked to set the units of the drawing as follows:

4 Length

i) Type- Decimal
ii) Precision- three (3) places (i.e., 0.000)

5 Insertion Scale

IX. Units to scale inserted content- Meters

6 Angle

i) Type- Deg/Min/Sec
ii) Precision- 0d00’00”
iii) The Clockwise Box below is clicked

5. The Direction icon below is clicked and a direction control dialogue box is opened. The North is selected.
6. The icon Points is clicked, the point settings are selected. The Coordinates icon is clicked to select the method of data arrangement (i.e., Easting-Northing). The type of Marker is also selected.
7. Under the point icon, the import/export point icon is selected.
8. The import point’s icon is selected. A dialogue box opens, the format in which the data is arranged is selected (E.g., ENZ (space delimited)). Also, the source file where the data is saved and ok is clicked to continue.

9. The points are imported and are joined with the polyline drawing icon on the AutoCAD Civil 2012 Environment. The OSNAP (object snap) below the AutoCAD Civil 3D 2012 Environment is switched on so as to highlight the endpoints for ease of joining the points.
10. On the Alignment icon, the icon define from polyline is selected.
11. The line is clicked and where the alignment is to start is also clicked; a dialogue box opens and the alignment is named.
12. On the Alignment icon, the station label settings is clicked; the station label increment, station tick increment and the station label offset are edited appropriately. The perpendicular labels and plus sign location are also clicked. Then the station labels are also created.
13. The Terrain is created by clicking on the Terrain icon, Terrain Model Explorer is selected. A dialogue box opens; a new surface is created and named. The point files are added, the format in which it is arranged is selected as well as the file where it is located. The surface is built by right clicking on it and select build. When the surface is built, the dialogue box is closed.

4.4.1 PROFILE GENERATION

On the Profile icon, sampling is selected and import is clicked. The Tangent Labels, Vertical Curve Labels and the Vertical Grid Lines values are edited appropriately. The created surface is made current by clicking on surfaces and set current surface. The profile is sampled by clicking on existing ground, sample from surface and accepting the beginning and ending stations. Then the profile is created by clicking on create profile, full profile is selected; a dialogue box opens where the grid height is adjusted and ok is clicked.

When the profile is created, the route is designed by first creating the Tangents along the route and the Vertical Curves are created by selecting the incoming and outgoing tangents and inserting the K- Value (see appendix).

4.4.2 CALCULATION OF THE VOLUME OF EARTHWORK

One of the applications of survey products (profile and cross section) is in determining the estimate of the volume or quantity of earthworks, it is necessary to know the volume of materials which would be required to cut and to fill in road construction. For the scope of this project, the volume and fill were determined from the cross section using AutoCAD land development software. This is done also for subsequent cross-sections and the volume is cumulatively summed up to obtain the final cut and fill (see appendix)

4.4.3 CUT AND FILL ANALYSIS

This is an important aspect in route survey data analysis. The volume of earthwork needed can be calculated to a high degree of accuracy. It helps in the area of project costing to determine earthwork and materials quantity. The cut and fill table is shown in the appendices. The total cut was estimated to be 16803.12m3 while the total fill is estimated to be 10563.82m3. Having subtract the total fill from the total cut, therefore, the volume of material needed to be cut is 6239.30m3

Refer to the appendix for the entire cut and fill data (Appendix).

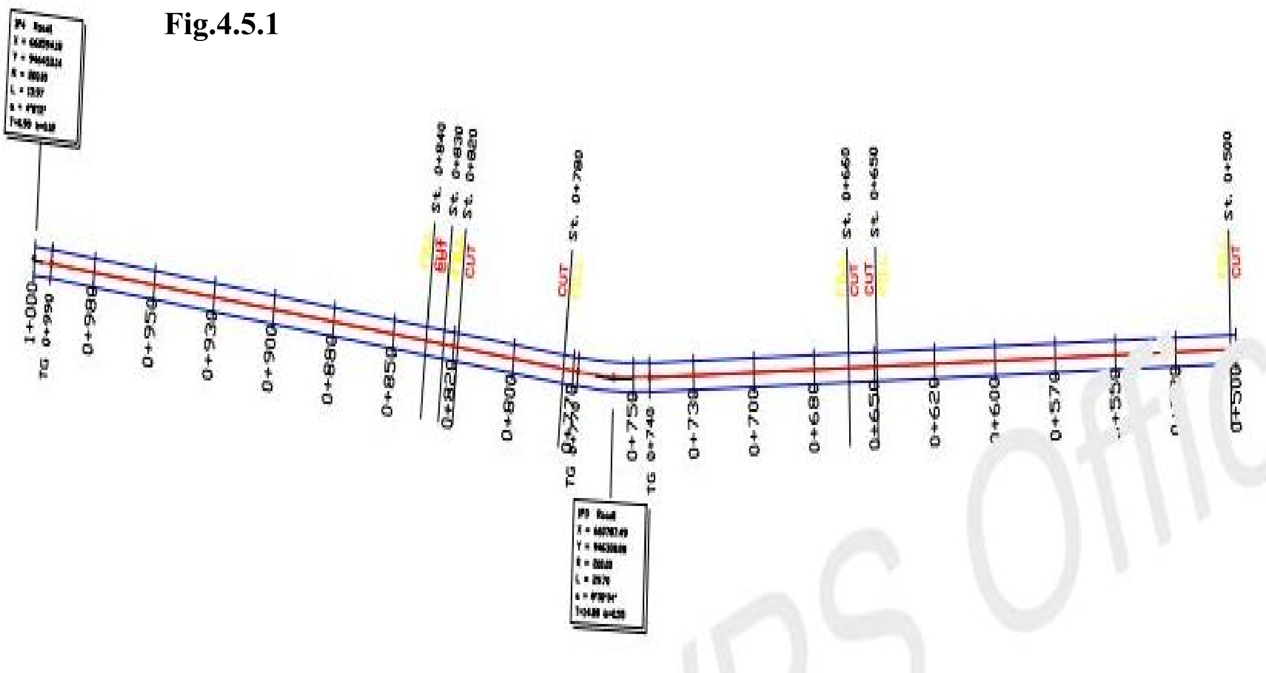
4.5 INFORMATION PRESENTATION/ PLAN PRODUCTION

The adjusted coordinates (X, Y, Z) were plotted in AutoCAD Civil 2012 Environment to generate the centerline of the road, longitudinal profile and cross-section. The details were also plotted.

4.5.1 DETAIL PLAN

The essence of obtaining a detail plan is to provide a platform for horizontal curve and alignment design for the road expansion/rehabilitation. Geometric information is also shown on the detail plan making a vivid representation of the land mass for easy understanding of the route.

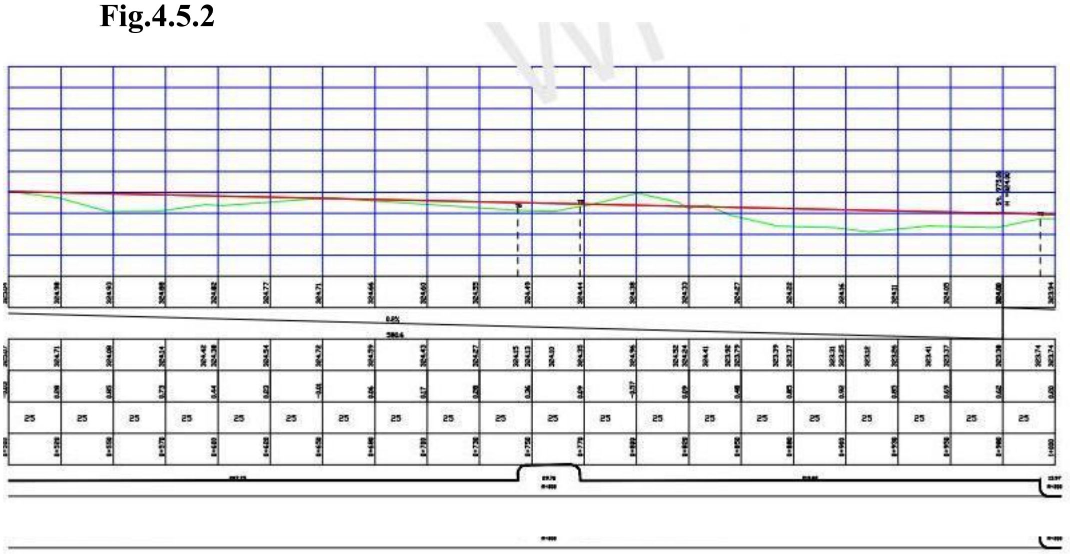
Fig.4.5.1



4.5.2 LONGITUDINAL PROFILE

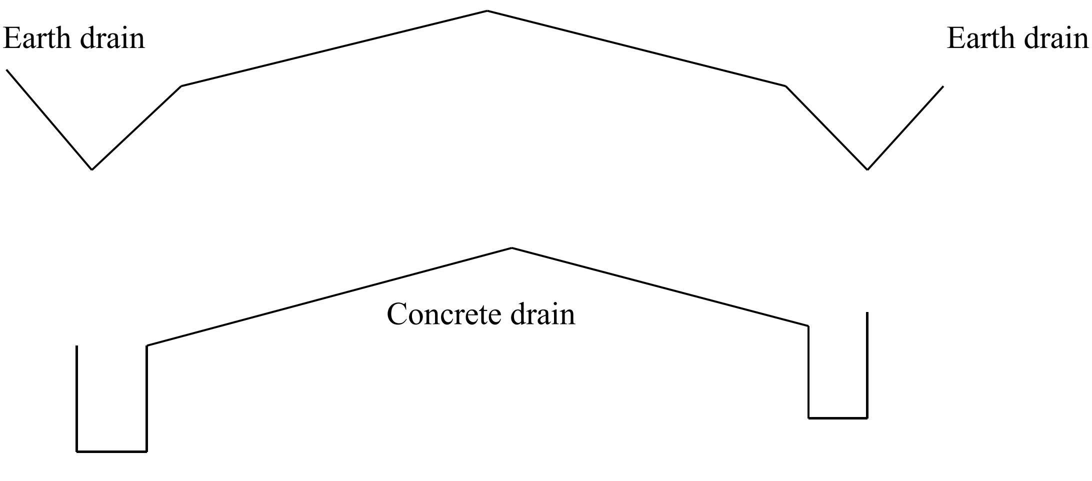
Profile was generated to provide vertical height/terrain information along a route for vertical alignment/curve design. It provides a vivid picture of the terrain and decisions of where to cut or fill was determined. It provides information such as the grade percent, tangent points, existing level and formation level.

Fig.4.5.2



4.5.3 CROSS-SECTIONS

Cross-section depicts the terrain information across the road chainage. Information such as the height of existing and proposed center line and embankments were shown. The cross-section parameters were used to generate the area and hence, volumes of earthwork in cut and fill analysis (see appendix).



Earth drainage was used throughout except where we have culvert, concrete drainage was used 150m before and 150m after each culvert, the culvert used was 800mm by 800mm because the volume of the water that will be flowing there is much. The concrete drainage used was 0.10cm thick and 0.60cm by 0.60cm for easy flowing of waters.

Having carried out the flying method to checks on the linear accuracy of the closing control, it was discovered that the linear accuracy conforms with third order accuracy which show that the closing controls could still be used for this project.

CHAPTER FIVE

5.0 COSTING, SUMMARY, PROBLEMEN COUNTERED, RECOMMENDATION AND CONCLUSION

5.1 PROJECT COSTING

To achieve this, the various project parameters were considered and their cost calculated to arrive at the total cost of the project. The costs are determined according to the project phases which are as follows;

i. Reconnaissance
ii. Field operation
iii. Data Processing
iv. Information presentation

Each of these aspects was cost based on the following components

i. Personnel
ii. Equipment
iii. Transportation
iv. Accommodation
v. Beaconing

COST AND ESTIMATION

1(a) RECONNAISSANCE

Duration (Estimated number of days = 2)

Personnel Daily Rate ₦	**Amount ₦**
1 Senior Surveyor	25,814.00
1 Technical Officer	20,542.00
4 Skill Laborers	5,078.00

1(b) TRANSPORTATION

Field Vehicle	
Mechanic	15,000.00

Driver	30,162.24
Fuel	20,432.91

1(c) FEEDING

Feeding for four person	₦10,000.00
TOTAL COST FOR RECONNAISSANCE	**₦208,931.1**

FIELD OPERATIONS

2(a) MONUMENTATION

Duration Estimated (Number of days) = 1

Personnel Daily	**Amount ₦**
1 Assistant Tech. of Officer	18,542.00
2 Labourers	4,076.00
3,000 Standard pegs	400.00
Basic Tools (Digger, Shovels, trowels, nail, hammer etc.)	15,000.00

2(b)TRANSPORTATION

Fuel	20,432.91
Driver	30,162.24
TOTAL COST OF MONUMENTATION	**₦1,288,213.1**

3(a) DATA ACQUISITION

Duration estimated number of days = 5 days

Personnel Daily	Amount₦
1 Surveyor	25,934.00
1 Assistant Surveyor	22,501.00
4 Labourers	4,078.00
Sub Total	**₦323,735.00**

3(b) EQUIPMENT LEASING

1 Total Station (With its accessories)	40,000.00
5 Ranging Poles	1,000.00 - 5,000.00

2 Cutlasses	2,000.00 - 4,000.00
Sub Total	**₦49,000.00**

3(c) FEEDING

5Days	5,000.00 -25,000.00
Sub Total	**₦25,000,00**

3(d) TRANSPORTATION

Duration estimated number of days = 5 days

Fuel	20,432.91- 102,164.5
Driver	5 Days
TOTAL COST OF DATA ACQUISITION	**₦510,822.75**

4. DATA PROCESSING AND PRODUCT GENERATION

Duration (Estimated number of days = 3 days)

Personnel Daily	Amount ₦
1 Surveyor	25,814.00 - 77,442.00
1 Computer Analyst	25,000 - 75,000.00
1 Computer hardware	12,000.00 - 36,000.00
Total	**₦565,326.00**

5. PLOTTING/TECHNICAL REPORTS

Duration (Estimated number of days = 2 days)

Personnel Daily	Amount ₦
1 Surveyor	25,814.00 - 51,628.00
1 CAD Operator	20,000.00 - 40,000.00
1 Clerical Officer	10,000 - 20,000.00
Total	**223,256.00**

6 ROUTE DESIGN

Duration estimated number of days = 2days

Personnel Daily	**Amount ₦**
1 Surveyor	25,814.00 - 51,628.00
1(one)Cad Operator	20,000.00 - 40,000.00
1 (one)Computer Hardware	12,000.00 - 24,000.00

Software used	10,000.00 - 20,000.00
Sub Total	**₦271,256.00**

7. PLAN PRINTING

Duration estimated number of days = 2day

Quantity Rate	Amount ₦
10 copies computer printing	1,200.00 - 12,000.00
10 copies of report	6,000.00 - 60,000.00
Binding	3,000.00 - 30,000.00
Sub Total	**₦102,000.00**

COST OF PROJECT EXECUTION	**₦3,567,539.95**
CONSULTANT FEES 20% OF TOTALCOST OF PROJECT	**₦713,507.90**
CONTINGENCE 5% OF TOTAL COST OF PROJECT	**₦178,376.9975**
VAT = 5% OF TOTAL COST OF PROJECT	**₦178,376.9975**
TOTAL COST OF PROJECT	**₦4,637,801.845**

5.2 SUMMARY

The project centered on route survey which is a type of survey under the broad engineering survey. It outlined the techniques, equipment's and personnel involved in executing the project and thereby producing the plan showing the route details, longitudinal and cross-sectional plotting of the project site. The data acquisition was achieved in the field using Topcon (ES-103) total station and .

The data collected were downloaded into the computer system using respective downloading softwares (Topcon Geo-office, Link, Hcloder, and HcRinex) connected through downloading cables. A digital cartographic software like AutoCAD Civil 3D Land Desktop Companion 2010 software was also used.

Upon successful processing and plotting using the collected data, there was an output both in softcopy and hardcopy format and finally there was a comprehensive report on all the activities involved during the project execution.

5.3 PROBLEMS ENCOUNTERED

The major problems encountered on the field are as follows:

i. The first problem encountered was a delay in the allocation of instruments to be used on though we later found a way out from other groups and the project work started immediately.

ii. Insufficient ground controls along the project site and the only way out was to establish enough controls along that route using DGPS and those controls established were used for the orientation and proper execution of the project exercise.

iii. Congested traffic of vehicles and obstructions from packed vehicles and pedestrians along the route caused some delays but due to enough patience, we solved the problem.

5.4 RECOMMENDATIONS

Having completed the project successfully, I hereby recommend the following:

i. More modern surveying equipment's should be budgeted for and purchased by the school for effective and productive practical tasks. This will ensure that project is carried out within the stipulated period of time.
ii. The department should make available good telecommunication gadgets to students for effective communication when working on site especially during project exercise.

5.5 CONCLUSION

From the analysis of result obtained in chapter four of the project write-up, it could be vividly seen that the project was carried out in accordance with engineering survey specifications which is a third order survey project.

Also, the field and office works were carefully and properly carried out in accordance with survey rules, regulations and specifications of this project.

Furthermore, I was able to acquire better knowledge and experience which will keep me in good stand as a technologist in Survey profession.

Despite the problems encountered on site and during the project exercise, the aim of the project was achieved.

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APPENDIX

POINT ID	EASTING	NORTHING	HEIGHT
tbm1	661425.0232	945950.9002	324.7349
tbm2	661402.8991	945939.4238	324.8356
0+00	661442.200	945926.970	324.735
0+25	661420.000	945938.470	324.836
0+50	661398.690	945951.520	324.052
0+75	661378.780	945966.520	324.381
0+100	661359.372	945982.380	324.975
0+125	661339.530	945997.580	324.401
0+150	661319.190	946012.120	324.517
Bld1	661298.380	946025.970	324.721
Bld2	661220.130	946039.130	324.038
ep1	661255.720	946052.050	325.034
0+175	661234.310	946064.960	325.367
0+200	661212.910	946077.870	325.296
0+225	661191.370	946097.560	325.744
0+250	661169.380	946102.460	325.889
0+275	661147.310	946114.200	325.735
0+300	661125.240	946125.950	325.836
0+325	661100.170	946137.690	325.052
epl2	661038.110	946149.440	325.381
0+350	661059.090	946161.280	325.975
0+375	661037.130	946173.240	325.401
0+400	661015.220	946165.270	325.517
0+425	660993.310	946197.310	324.721

0+450	660971.400	946209.350	324.038
tbm3	661457.0369	945934.9291	324.0516
tbm4	659614.397	946950.4665	325.3805
epl3	660949.490	946221.300	324.034
sch1	660927.600	946233.430	324.367
sch2	660275.670	946245.470	324.296
0+475	660883.760	946257.510	324.744
0+500	660661.840	946282.230	324.735
0+525	660618.840	946295.060	324.836
0+550	660787.490	946308.077	324.052
0+575	660776.140	946321.080	324.381
0+600	660754.860	946334.190	324.975
0+625	660733.920	946347.850	324.401
tbm5	659610.4873	946908.8838	325.975
tbm6	657863.5358	947370.1275	325.407
0+650	660713.372	946362.080	323.517
0+675	660693.220	946376.870	323.721
rd1	660673.400	946392.120	323.038
rd2	660653.620	946407.400	323.034
0+700	660633.830	946422.680	323.367
0+725	660614.050	946437.960	323.296
0+750	660594.180	946453.140	323.744
0+757	660574.100	946468.030	323.889
0+800	660553.810	946482.610	323.735
0+825	660533.310	946496.950	323.836
0+850	660512.610	946510.970	323.052
0+875	660491.720	946524.690	323.381

0+900	660470.620	946538.110	323.975
0+925	660449.340	946551.230	323.401
0+950	660427.880	946564.040	323.517
0+975	660406.230	946576.550	323.721
1+000	660384.410	946588.750	323.038
1+025	660362.410	946600.630	323.034
cul1	660340.250	946612.190	324.167
cul2	660317.930	946623.450	324.296
cul3	660295.550	946634.590	324.344
cul4	660273.170	946645.740	324.459
tbm7	660267.0369	946661.9219	323.554
tmb8	660257.0389	946663.9219	324.612
1+050	660250.790	946656.880	323.735
1+075	660228.410	946668.030	323.836
1+100	660206.030	946679.170	323.052
1+125	660183.660	946690.320	323.381
1+150	660161.280	946701.460	323.475
1+175	660138.880	946712.580	325.401
1+200	660115.600	946721.650	323.517
1+225	660092.050	946730.040	323.721
1+250	660068.500	946738.430	323.738
1+275	660044.950	946746.820	323.804
1+300	660021.400	946755.210	323.817
1+325	659997.850	946763.600	323.826
1+350	659974.300	946771.990	323.844
1+375	659950.750	946780.380	323.871
1+400	659927.370	946789.230	324.035

1+425	659904.320	946798.910	324.036
1+450	659881.640	946809.410	324.052
1+475	659859.250	946820.550	324.081
1+500	659836.900	946831.740	324.175
1+525	659814.540	946842.930	324.201
1+550	659792.180	946854.100	324.417
1+575	659769.700	946865.040	324.721
1+600	659747.090	946875.700	325.038
1+625	659724.340	946886.070	325.046
1+650	659701.470	946895.160	325.267
1+675	659678.470	946905.970	325.316
tbm8	661457.0369	945934.921	324.0516
tbm9	661461.1865	945967.091	324.9271
1+700	659655.350	946915.480	325.744
1+725	659632.120	946924.710	325.889
1+750	659632.120	946924.710	325.889
1+775	659585.310	946942.290	326.003
1+800	659561.740	946950.630	326.052
1+825	659538.080	946958.690	326.081
1+850	659514.310	946966.440	326.123
1+875	659490.450	946973.900	326.154
1+900	659466.500	946981.060	326.047
1+925	659442.460	946987.920	326.026
1+950	659418.360	946994.570	326.018
1+975	659394.260	947001.220	325.998
2+000	659370.150	947007.880	325.982
2+025	659346.050	947012.500	325.886

tbm10	659337.091	947014.378	325.873
tbm11	65935.981	947018.285	325.859
2+050	659321.950	947021.140	325.844
2+075	659297.850	947027.780	325.829
2+100	659273.690	947034.200	325.798
2+125	659249.450	947040.310	325.736
2+150	659225.130	947046.130	324.052
2+175	659200.750	947051.640	325.381
2+200	659176.290	947056.840	325.975
2+225	659151.780	947061.740	325.401
2+250	659127.200	947066.330	325.317
2+275	659102.570	947070.610	325.276
2+300	659077.900	947074.620	325.288
2+325	659053.210	947078.580	325.263
2+350	659028.530	947082.540	325.206
2+375	659003.840	947086.500	325.174
2+400	659003.840	947090.460	325.144
2+425	658979.160	947090.460	325.089
2+450	658954.480	947094.420	324.935
2+475	658929.790	947098.380	324.896
2+500	658905.110	947102.340	324.852
2+525	658880.420	947106.300	324.791
2+550	658855.740	947101.260	324.775
tbm12	658849.440	947114.252	324.729
tbm13	658838.195	947118.239	324.712
2+575	658831.050	947114.220	324.701
2+600	658806.370	947118.180	324.617

2+625	658781.580	947121.360	324.591
2+650	658756.620	947122.800	324.582
2+675	658731.670	947124.400	324.534
2+700	658706.790	947126.760	324.467
2+725	658881.990	947129.890	324.296
2+750	658657.290	947133.780	324.644
2+775	658632.630	947137.870	524.889
2+800	658607.970	947141.960	324.935
2+825	658583.300	947146.060	325.036
2+850	658558.640	947150.150	325.052
2+875	658533.980	947154.250	325.281
2+900	658509.320	947158.340	325.375
2+925	658484.650	947162.430	325.401
2+950	658459.990	947166.530	325.517
tbm14	658447.981	947168.590	325.542
tbm15	658439.695	947169.611	325.663
2+975	658435.330	947170.620	325.721
3+000	658410.670	947174.720	325.838
3+025	658386.020	947178.910	325.934
3+050	658361.500	947183.790	326.067
3+075	658337.150	947189.440	326.196
3+100	658312.980	947210.840	326.244
3+125	658289.030	947202.990	326.389
3+150	658265.310	947210.880	326.435
3+175	658241.840	947219.500	326.536
3+200	658218.440	947228.300	326.652
3+225	658194.890	947236.670	326.681

3+250	658171.160	947244.550	326.775
3+275	658147.300	947252.020	326.801
3+300	658123.430	947259.440	326.817
3+325	658099.560	947266.860	326.921
3+350	658075.680	947274.290	327.002
3+375	658051.810	947281.710	327.014
3+400	658027.940	947289.130	327.067
3+425	658004.060	947296.550	327.146
3+450	657980.080	947303.600	327.174
3+475	657955.970	948731.200	327.189
3+500	657931.850	947316.790	327.235
tbm12	657918.640	947304.190	327.251