PROJECT REPORT

ON

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

BY:
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HND/23/SGI/FT/0087

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

MAY 2024

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.

……..…….

PIUS RACHEAL NAOMI

DATE ……

CERTIFICATION

This is to certify that **PIUS RACHEAL NAOMI** with Matric No **HND/23/SGI/FT/0087** 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 himself with the due diligence, honesty and sobriety on the said duties.

…. …… **DATE: ……**

SURV. R.O ASHONIBARE

(SUPERVISOR)

…. …… **DATE: ……**

SURV. ISAU IBRAHIM ABIMBOLA

(H.O.D)

…. …… **DATE: ……**

SURV. R. AWOLEYE

(PROJECT COORDINATOR)

…… **DATE: ……**

EXTERNAL SUPERVISOR

DEDICATION

I dedicate this project to almighty God the creator of the universe and all living things and non living things in the earth.

ACKNOWLEDGEMENTS

All adoration be to God Almighty, the gracious one who has given me the opportunity to complete my HND program in Surveying and Geo Informatics.

My appreciation goes to my supervisor **Surv. R.O ASHONIBARE** for his encouragement and motivation as regards the project thank you and God bless you sir.

To all my lecturers in the department of Surveying and Geo Informatics, **SURV. A.I ISAU, SURV. A.G AREMU, SURV. R.S AWOLEYE, SAURV. A.O AKINYEDE, SURV. AYUBA ABDULSALAM, SURV. F.D DIRAN AND SURV. BABATUNDE KABIR,** may God bless you all (Amen).

I also express my sincere gratitude to my wonderful parents **MR.** and **MRS. OGBADA PIUS** for their parental care and support since the inception of my educational career, they stood by me when things were tough and rough for me, they gave me hope, I will forever be grateful for the motivation you always gaves to me at all time, if I would have to have parents in my life again, I will pray to have people like you around me again.

To all my understanding friends and lovers, I so much appreciate your support and advice thanks so much, May almighty God bless you all (Amen).

PIUS RACHEAL NAOMI

MAY 2025

ABSTRACT

This project topic route survey is an engineering survey carried out to acquire base line data required for the rehabilitation of route along Mandala/Awe to Adigongo Moro Local Government, Kwara Ilorin. Ground survey method was adopted in the data acquisition with the use of digital (Topcon (ES-103) total station) instruments. The exercise involved traversing and leveling. Traversing was carried out to adequately locate the path of the route while leveling was used to determine the height of points at 25m interval along the centre line and for cross-section at offset distance of 4m, (8m) intervals on both sides of the centre line. Also the total station was used to determine the heights of drainage edges. The data acquired were processed manually and by the use of computer system and some applications like AutoCAD Land Development and Microsoft Office Excel software. The end result was the production of the location plan of the route, longitudinal profile and the cross section plans of the route all at suitable scale both in digital and graphic formats. Finally a project report was written.

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CHAPTER ONE

1.0 INTRODUCTION

1.1 BACKGROUND TO THE STUDY

In the prehistoric time, road used by people were wilding tracks beaten by wild animals. With time, people begin to improve the paths by filling the holes with earth laying logs across the soft boggy spots. These attempts were crude, but they were beginning of road construction. As people began to transport goods over long distances, they developed new ways of travelling. Firstly they packed their wares on animals, and then they invented various kind of sled. Finally after the invention of the wheels, they built wagon. Each advancement brought a need for better travelling routes which brought the need for route survey Extract from the new book of knowledge deluxe home edition, Grolier (1998).

In the world of engineering and environmental studies, surveying has been recognized as the inevitable operation supposed to be the first assignment carried out before any other exercise can take place, thereby defining surveying as the bedrock of any meaningful development. Banister and Raymond (1992) defined surveying as the art of making relative measurement of natural and artificial features on the surface of the earth and the plotting of these measurement to suitable scales to form a map, plan or section.

Surveying was defined by Wilson (1978) as the art and science of making measurement of relative positions of points on, below or above the surface of the earth and the plotting of these measurements to some suitable scale to form a map, plan or chart. Oliver (1984) stated that surveying consist of many different operation and techniques but underlying them all are some basic principles which provides unity and discipline to the profession are few and simple. They provide the most effective and economics basis for conducting surveys and they are as follows:

To work from whole to part :- this means that for any particular survey, whether it is of entire country or an area of small extent, the main framework of the survey should be set or established on the ground.

The second principle is that surveyor has to choose the method of survey most appropriate to meet the desire or expected result since there are ways to meet specific purpose.

There is a suitable specification for the accuracy of the required survey that needs to be met. The more refined techniques and instrument employed, the greater the accuracy obtained.

The third principle is the provision of adequate checks to all survey operation to guide against error. A survey operation must be carried out in such a way that no error will pass undetected.

Generally, surveying is divided into two main types which are: plane and geodetic surveying. Plane surveying; this is the science of surveying aspect that deals with the area of limited extent of country land with the assumption that the earth surface is plane while Geodetic surveying is the aspect of surveying that determines the size, shape of the earth and its gravity field with the earth curvature put into consideration (Brinker and Wolf 1980). They further stated that Surveying as a wide profession can also be subdivided into different branches depending on the application of the above mention type, which are as follows, to mention few;

Cadastral surveying

Engineering surveying

Hydrographical surveying

Topographical surveying

Mining surveying

Photogrammetric surveying

Remote sensing

Geodetic surveying.

Uren and price (1994) Opined that engineering surveying is a general expression for a survey work carried out in connection with civil engineering and building projects. They also stated that the main purposes of engineering surveying are as follows:

i. To provide large scale topographical plans and other measurement used in design stage.

ii. To provide precise framework at the construction stage.

iii. To monitor structural movement on major retaining structure at the post construction stage.

Surveying plays a key role in the development of engineering project such as hydroelectric schemes, irrigation, alignment of roads, tunnels and transmission lines, locations and construction of dams, aqueduct (a structure like bridge that takes water across a valley), development of cities, flood controls and development and maintenance of harbors. In all these projects, the role of surveyor is to render services to the design engineers that to provide information relevant to the design and construction of the project.

Mc Maury (1980) described route survey as the constructional processes and procedures that are involved in the production of routes designs such as roads, pipelines, railways, and transmission lines. Route survey can be seen as the survey carried out in establishing the horizontal and vertical alignment of a particular area needed for social utilities like highways, canals etc. It can also be applied to where and when alignment is needed for the rehabilitation or expansion of existing route (road). Thus this project can be said to have the aim of providing information on the configuration of the terrain, the details on it and the topographical information of a study area. During the planning stage of a route survey, the surveyor should know the specifications which will enable him to carry out the job accurately and precisely and also ensure the following.

(a) Easy communication and transportation network between the communities involved.

(b) Acquisition of data which will enable the construction engineer to carry out design on a specific site.

Whatever the nature of the project, the role of the surveyor is to render services to the design engineer by providing information relevant to the design and construction of the project. The stages of development in any given project may be classified into three;

1. Investigation and planning stage

2. Design stage

3. Construction stage

At the investigation and planning stage, the surveyor and other committee attached to the project will look for the location of the project and mark out the area of interest. Then the detailed large scale plan of the area of interest will be produced. The plan produced will serve as the base map for costing and for both architectural and structural design of project.

At the design stage, based on the large scale map produced by the surveyor the architects and structural engineers attached to the project will come out with both architectural and structural design of the project. The role of surveyor here is to guide the architects and the engineers on the interpretation of the plan (base map) he has produced.

At the construction stage, the role of the surveyor is to set out the design plans (large scale plan) produced by the architects and the structural engineers on the site for effective construction of the project. Setting out is the reverse of preparation of a map or plan showing the existing features on the ground. It is the process of fixing on the ground the details shown on a map or plan.

1.2 STATEMENT OF PROBLEMS

It was discovered that the route from Mandala Via Awe to Adigongo Village Moro Local Government Area Ilorin Kwara State, that part of it is not tarred. Soil erosion had greatly affected the untarred part of road, and it has rendered a great portion not motorable. This is greatly affecting the socio economic activities of those living in the area. In order to help those living in the area and ensure that the road is motorable due to economic importance of road, the route survey of the whole of this road was assigned to us as our final project so that the necessary data about the road can be gathered for the design and rehabilitation of the road.

1.3 AIM AND OBJECTIVES OF THE STUDY

1.3.1 AIMS OF THE STUDY

The main aim of this project is to carry-out Route Survey of Mandala-Yowere Village in Moro Local Government Area, Kwara State. This is to provide geospatial information necessary for the rehabilitation of the road.

1.3.2 OBJECTIVES OF THE STUDY

The objectives of this project include the following:

i. To provide horizontal and vertical alignment of the site

ii. To provide the leveling both longitudinal and cross sectional profile of the route

iii. To provide a comprehensive information necessary for the construction of the route

iv. To produce a plan showing relationship between established route controls according to survey rules and departmental instruction.

1.4 PROJECT SPECIFICATIONS

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

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

b. Third order EDM traverse must be run along the route on all turning points at one zero observation.

c. Linear measurement must be done with the use of steel tape or electronic distance measurement (EDM).

d. Leveling must commence from a known benchmark and closed on same or another known benchmark.

e. Leveling must be observed at every 25m intervals on the centre line and at 8m and 4 intervals on both sides of the centre line for the cross sectioning. Edges of drainage at both sides should be heightened.

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

g. Three plan i.e location plan, profile plan and cross sectional plan of the route surveyed should be produced.

1.5 SCOPE OF THE PROJECT

The entire project covered the following:-

i. Reconnaissance (both office planning and field reconnaissance).

ii. Selection of stations.

iii. Topcon (ES-103) total station and data recording.

iv. Linear measurement

v. Spirit leveling.

vi. Fixing of details.

vii. Data processing.

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

ix. Data presentation.

x. 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

Below are the under listed names of 2024/2025 HND student who are member of this group that participated in the successful execution of this project:

(I)	**PIUS RACHEAL NAOMI**	**HND/23/SGI/FT/0087(AUTHOR)**
(II)	AHMED SAHEED TOYYIB	HND/23/SGI/FT/0084
(III)	OMOLABI MARVELOUS TAIWO	HND/23/SGI/FT/0089
(IV)	MOHAMMED NAFISAT	HND/23/SGI/FT/0088
(V)	FADUMILA KAYODE OLUWATUBOSUN	HND/23/SGI/FT/0082

(VI) AKINPELU OLASHILE RIDWAN HND/23/SGI/FT/0085

(VII) YAKIN RAUF OLUWAFEMI HND/22/SGI/FT/0118

(VIII) ADEDEWE VIVIAN ODUNAYO HND/23/SGI/FT/0115

1.7 PROJECT AREA

The project site is the route of Mandala/Awe to Adigbongbo 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”

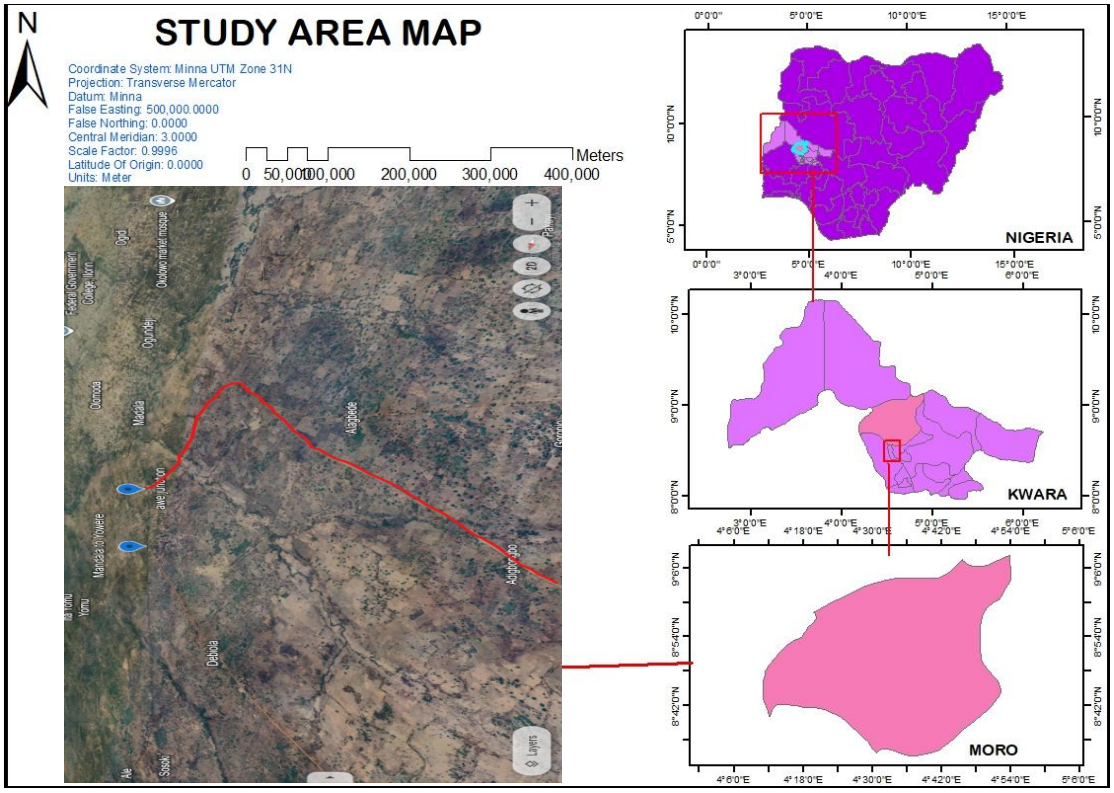


Fig 1.1: Study Area

Source:-GoogleEarth

CHAPTER TWO

2.0 LITERATURE REVIEW

Surveying began in Babylon and Egypt in the form of field measurements. The great pyramids which are mystery hitherto could not have been built without the knowledge of surveying principles in spite of the conflicting views about its physical construction. The Egyptians used stones to mark boundaries of their farmland along Nile valley as temporary beacons even though the beacons used to be washed away later. This led to proper and solid demarcation of boundaries by permanent beacons (Clark, 1972).

Barnister and Raymond (1977) defined surveying as the art of making measurement of relative position of natural and man-made features on the earth surface and the plotting of the measurements to some suitable scale to form a map, plan or chart.

Thomas & Norman (1961) defined engineering surveying as expression for any survey work carried out in connection with the construction of civil engineering and building project. They also stated that engineers and surveyor involved in site surveying are responsible for all aspect of dimensional control on such schemes. They further stated that the main purpose of engineering surveying are:

i. To provide large scale topographical maps/plans and other measurements at the concept and design stage.

ii. To provide precise framework at the construction stage.

iii. To monitor structural movement on major retaining structure at the post construction stage.

Wilson (1977) opined that when there is need for design of route to be carried out, different type of plans must be acquired to enable such design to be approximately done. Such plan may be cadastral and topographical in nature.

He further explained that engineering surveying is divided into design-data survey and construction survey. A design-data survey is an orderly process of obtaining data that is needed for the planning and design of an engineering report. The activities involved in design-data surveying vary according to the type and existing owner of the engineering or construction project. For example, the activities might include simply obtaining topographic data for a

proposed building site or they may include extensive route surveying and soil investigation for a highway.

A route survey as the name implies is a survey that deals with the route or course that imaginary road or utility line will follow while the end product of a route survey for a highway certainly differs from that of a utility line, it may nevertheless be said that the purpose of the route survey are to:

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

ii. Gather enough information about the general route to make it possible for designers to select the final location of the route.

iii. Mark this final location.

Reginnal (1968) defined route survey as the survey necessary for the location and construction of lines of transportation or communication such as highways, canals, transmission lines and pipelines. He stated that the location and construction survey may consist of:

Establishing the centre line by setting at intervals and running level to determine profile of the ground along the centre line

a. Taking cross section

b. Plotting such profile and fixing grades

c. Calculating volume of earthwork

d. Measurement of drainage areas

e. Laying out structures such as bridges and culverts.

The execution of route surveying entails some basic processes as far as data acquisition is concerned. These are outlined as follows:

i. Traversing

ii. Leveling

iii. Detailing

iv. Curve designation

Traverse is a sequence of connected straight lines whose direction and distances have been measured. Traverse is also the process of connecting series of lines with known bearings and distances. It is subdivided into first order for precise measurement and second order for the establishment of secondary controls while the third order is meant for survey of tertiary and topographical features.

Basak (2000) explained leveling as the art of determining the relative vertical heights of different point on the earth surface.

Detailing is defined as the process of fixing topographical features to the survey line. Any of these under listed methods could be used:

1. Chain survey method (tie line and offset)
2. Plane table survey method
3. Compass survey method
4. Tacheometric method
5. By the use of total station

Robert (2000) stated that designing of route without a large scale and up-to-date mapping through dense vegetation is a challenge. He further explained that aerial photograph is very unpunctual and may not give the expected results but air borne lidar of remote sensing techniques could be more accurate, faster, reduce the required ground survey control.

Brinker and minick (1987) stated that tunnels, dams, sewer lines, pipelines and transmission lines are engineering construction works having linear shapes which are classified as route. Hence, route survey as a unique system for expressing route geometry has developed to a broad range used in executing project by all surveyors, designers and contractors.

It was narrated by Vincent-Tao and El-Sheimy (2000) that the best way of acquiring data and information during the survey for the purpose of rehabilitation of a highway route could be done using mobile mapping system.

A comprehensive route survey consists of some operations which are:

1. Reconnaissance
2. Preliminary survey
3. Location survey
4. Construction survey

A reconnaissance is a rapid and rough survey in which a thorough examination of the area through which the proposed survey line is to run is conducted to ascertain the best routes and the approximate cost of the project. The reconnaissance survey is the key to the project and therefore must be done under the supervision of an experienced engineer who should be unbiased, resourceful, and gifted with aptitude of engineering projects and having wide power of observation for the present as well as for the future requirements.

The first step in reconnaissance survey is to collect the available map and aerial photography of the area. Various possible routes are marked on the map keeping the general topography of the area in mind. The area under consideration is examined in detail in order to assess the feasibility and relative merits of all the possible routes.

In the second step of reconnaissance, approximate elevation and distances are measured. The directions and angles are also measured by using magnetic compass.

A preliminary survey is a detailed survey of a narrow strip of the country through which the proposed line is expected to run. The purpose of such survey is to prepare an accurate topographical map of the selected belt of the country to arrive at a close estimate of the cost of the line. Preliminary survey also help in the preparation of construction plans.

The field work in preliminary survey usually consist of traversing by theodolite along the selected route and the distances, heights and angles between the traverse stations are measured accurately in order to prepare a topographical map of the selected narrow stip. The preliminary survey should be quite accurate so that the selection of the final alignment can be made.

Location survey is carried out in two stages:

a. Office location

b. Field location

OFFICE LOCATION: This involves marking of the selected final alignment including the horizontal curves at the desired locations on the map of the selected strip. This is known as paper location. The final alignment may be anywhere in the stripe and in most favourable position. The longitudinal section or profile is the final alignment from the contours on the map and grade line is marked on the profile in pencil.

The following points should be considered while selecting the final alignment

1. Minimum gradient
2. Minimum curvature
3. Equalization(balancing) of earthwork
4. Heavy earthwork
5. Minimum number of expensive bridge
6. Minimum number of retaining and breast walls
7. Suitable crossing for rivers

FIELD LOCATION: - This is the process of transferring the paper location of the final alignment of a route to the ground i.e. it is the setting out of the paper location on the ground. Sometimes minor changes in the alignment are made in the field location if necessary.

The centre line of the final alignment of the route is set out on the ground by the following methods:

1. By intersection between the paper location of the alignment and the traverse
2. By scaling the position of the various points on the map and transferring them to the ground.

Schofield (1972) stated that the purpose of the construction survey is to re-establish points, lines and grades on the ground for construction of the project. It is essentially setting out the details of the route on the ground. It also consists in setting out culverts, bridges, aqueduct, siphons, etc and in carrying on such other surveying as may be needed for the purpose of construction.

A project construction engineer is entrusted with the entire job which may consist the following:

a. Visiting the located line and checking the location stakes.
b. Resetting the missing or disturbed stakes from the field notes.
c. Checking the levels of various points and establishing additional benchmarks.
d. Setting out additional stakes at the intersections of the tangents.
e. Setting out the side slope stakes for earthwork as well as grade stakes.
f. Setting out the stakes for structures such as culverts, bridge abutments etc.
g. Setting out the curves (simple, transition and vertical).
h. Setting out the sides of barrow pits.
i. Taking final cross-sections for ascertaining the quantity of earthwork.
j. Determining the water way for each bridge.
k. Measuring the finished work at regular intervals for regular payment of the constructors.

Most of the roads we ply were as a result of the application of route survey, for example: right of way and acquisition survey was carried out by Setraco Nigeria Limited on Abuja-Keffi road (52km) for the purpose of expanding the road. Automated survey method was used and some of the survey instruments used were GPS and its accessories, Total stations, EDM, Digital level etc. the survey was completed in July 2000, due to delay in paying compensation to the affected land owners, further encroachment were recorded within the right of way.

Dantata and Sawoe Nigeria limited were responsible for that of Jibiakaro Namoda-Gusau road (161km), some of the survey instruments stated above were also used. This was done to determine: the extent of the area that is needed for expansion of the road, the details of all the properties and buildings that fall within that area, knowing the details of owners of such properties for the payment of compensation for the right owner and also it aid in determining an estimate of the amount to pay as compensation (Idemudia, 2007).

Route surveying is an engineering works which takes interest part in construction works. Hence the improvement in the economy has contributed tremendous increase in population of

vehicles, advancement in construction technology trained professional and emergency of caterpillars. Therefore route surveying will no doubt serve as a means of improving the condition of the road and hence alleviates the problems of transportation.

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

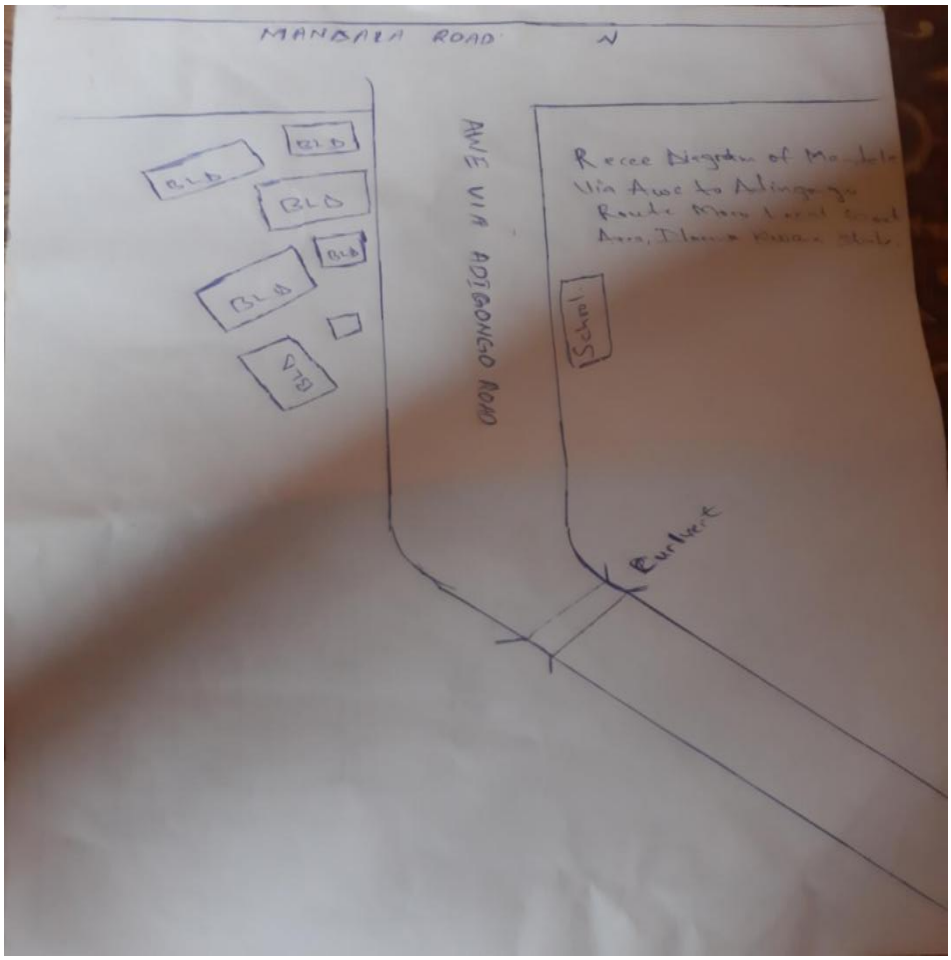
The field reconnaissance was done after the office planning it involved a visitation to the project site by all the group numbers to have a pre requisite knowledge of how it looks like and how the field operations would be carried out.

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. 1 Field Recci diagram Mandala Via Awe to Adigongo Route.



3.2 A TYPICAL PEG USED

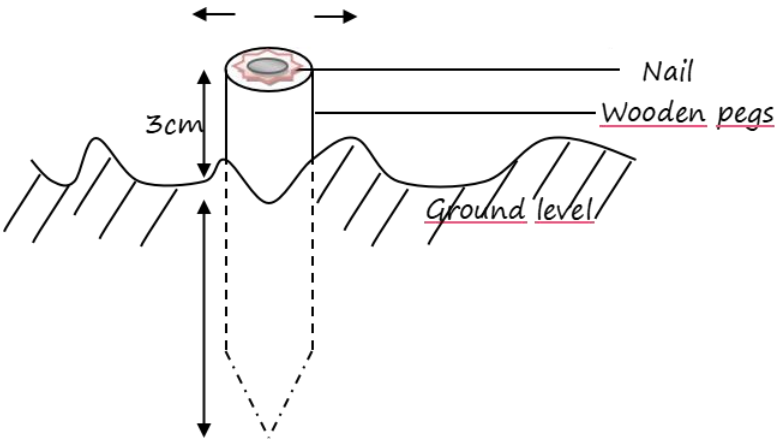


Fig 3.2 An Illustration diagram of peg

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

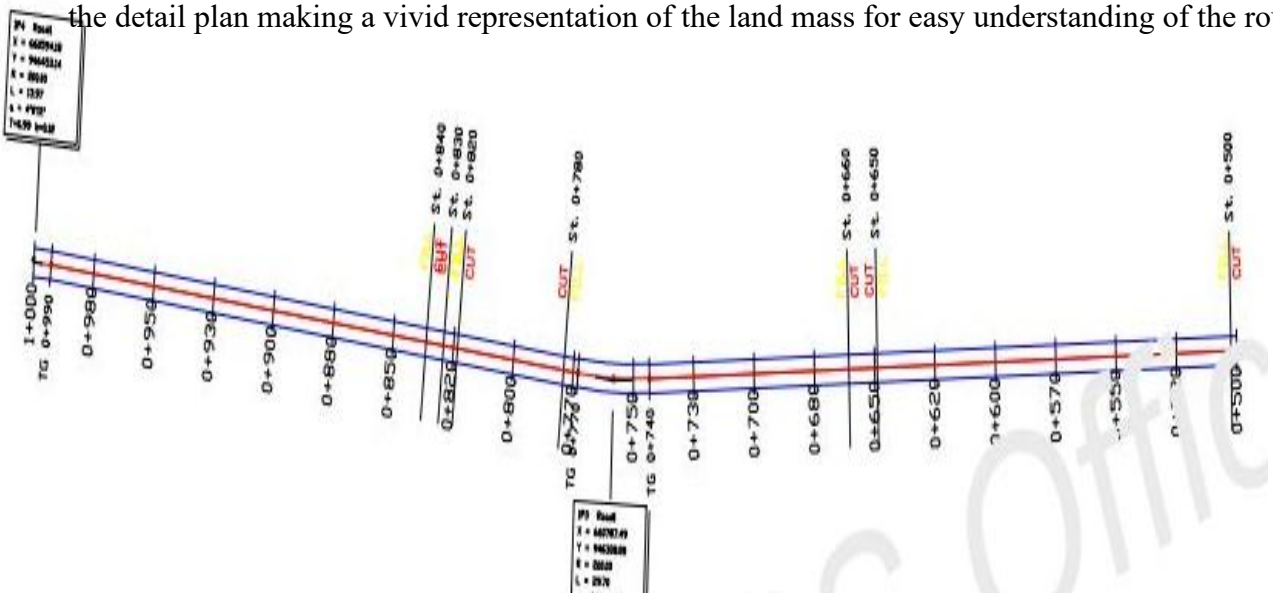
Refer to the appendix for the entire cut and fill data (Appendix).

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.

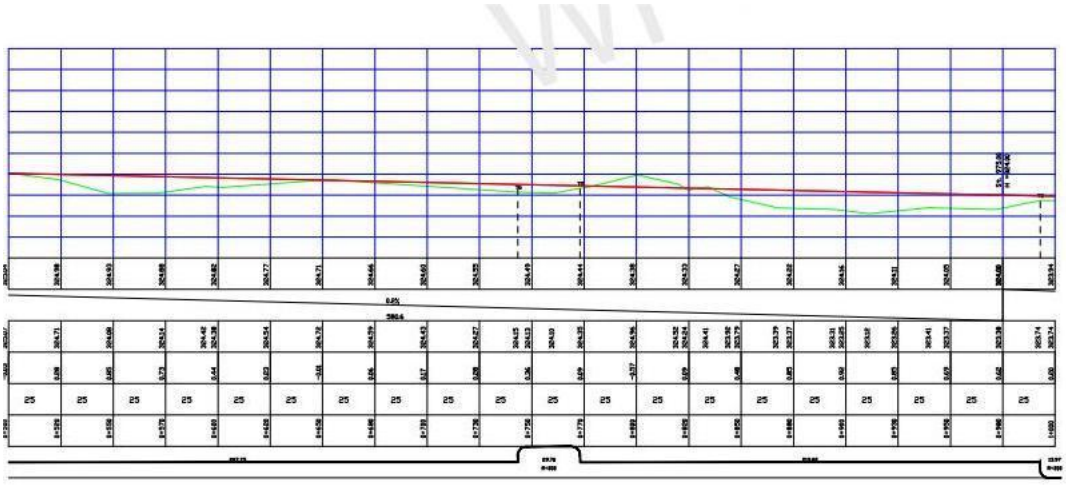
4.5.1 DETAIL PLAN

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.



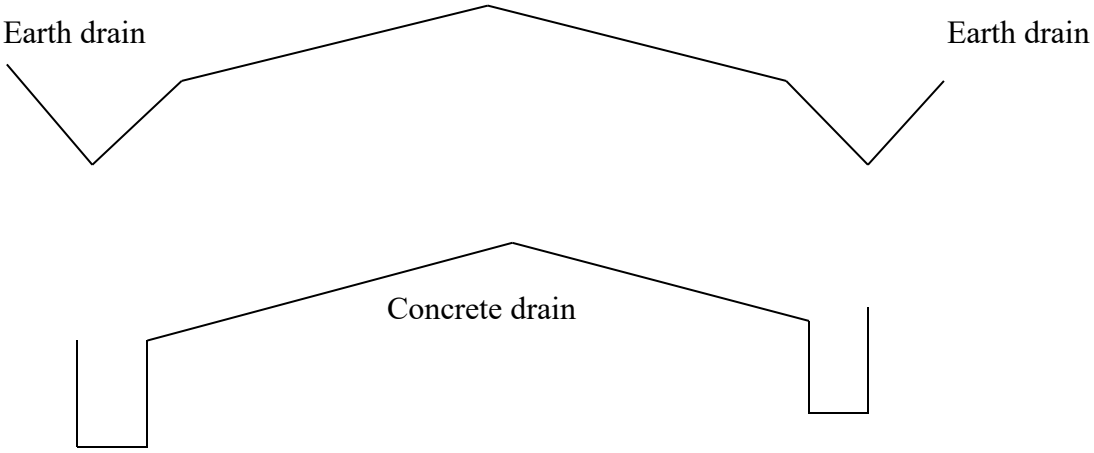
4.5.2 LONGITUDINAL PROFILE

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.



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	+	Driver
Mechanic	+	Fuel 20,162.24

1(c) Accommodation Feeding

Feeding for six person	₦10,000.00	
TOTAL COST FOR RECONNAISSANCE		**₦153,339.28**

FIELD OPERATIONS

Duration Estimated (Number of days) = 1

2(a) **MONUMENTATION**

Personnel Daily₦	Amount ₦
1 Assistant Tech. of Officer	18,542.00
2 Labourers	4,076.00
3,000 Standard pegs	400.00
Transportation	
Field vehicle + Driver	
Mechanic + Fuel 20,162.24	
Basic Tools (Digger, Shovels, trowels, nail, hammer etc.)	15,000.00
TOTAL COST OF MONUMENTATION	**₦1,261,856.24**

3(a) **DATA ACQUISITION**

Duration estimated number of days = 5 days

Personnel	Daily	Amount ₦₦
1 Surveyor	25,814.00	

1 Assistant Surveyor	23,571.00
4 Labourers	5,078.00
Sub Total	**₦348,485.00**

3(b) **EQUIPMENT LEASING**

1 Total Station	20,000.00
(With its accessories)	2500.00
5 Ranging Poles	500.00 2,500.00
4 Cutlasses	1500.00 6,000.00
Sub Total	**₦31,000.00**

ACCOMMODATION/FEEDING

5Days	30,000.00 -150,000.00
Sub Total	**₦150,000,00**

TRANSPORTATION

Field Vehicle	+	Driver 5 Days
Mechanic	+	Fuel 20,162.24 - 100,811.2

TOTAL COST OF DATA ACQUISITION **₦630,296.2**

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	20,000 - 60,000.00
1 Computer hardware	5,000.00 - 15,000.00
Total	**₦152.442.00**

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	10,000.00 - 20,000,00
1 Clerical Officer	6,000 - 12,000.00
Total	**83,628.00**

6 ROUTE DESIGN

Duration estimated number of days = 2days

Personnel Daily	₦Amount ₦
1 Surveyor	25,814.00 - 51,628.00
1(one)Cad operator	3,000.00 - 6,000.00
1 (one)Computer hardware	10,000.00 - 20,000.00
Software used	10,000.00 - 20,000.00
Sub Total	**₦97,625.00**

7. PLAN PRINTING

Duration estimated number of days = 2days

QuantityRate	₦Amount ₦
10 copies computer printing	1,000.00 - 10,000.00
7 copies of report	5,000.00 - 35,000.00
Binding	2,500 - 17,500.00
Sub Total	**₦62,500.00**

COST OF PROJECT EXECUTION **₦2,971,181.75**

CONSULTAT FEES 20% OF TOTALCOST OF PROJECT **₦148,559.0875**

CONTINGENCE 5% OF TOTAL COST OF PROJECT	**₦594,236.35**
VAT = 5% OF TOTAL COST OF PROJECT	**₦594,236.35**
TOTAL COST OF PROJECT	**₦4,308,213.5375**

5.2 SUMMARY

In any project undertaken, the difference between successful completion of the project and achieving the design always exists, this project was not only successful, the design objective was achieved as seen from all indication. This report was on route survey in which the background of the study was defined. The purpose or significance of study, the scope and personnel which carried out the project and the study area was also known in this project report.

Furthermore, the literature review was done as well as reconnaissance, data acquisition , data processing leading to plan production. Finally the analysis of result, conclusion and recommendation were presented in this project report.

5.3 PROBLEM ENCOUNTERED

The major problem encountered during the execution of the project was that some of our pegs were removed which made us to re-establish new ones, thereby delaying the execution of the project. Also some of the leveling staffs given were not good enough, they were with faded graduation and stiff. Another problem encountered was the intervisibility between the initial control, but the problem was later rectified.

5.4 RECOMMENDATIONS

As a result of the experience gained during the course of the project, I would like to make the following recommendation:

The federal government should mandate it that before any route must be constructed the plan or map of the route must be produced, which comprises of proper traversing, cross sectional profile and longitudinal profile.

5.5 CONCLUSION

The aim of the project was achieved sequel to the fact that high data integrity was ensured and the analysis of result is quite satisfactory. The project has also provide an avenue for me to have a very clear understanding and practical exposure in surveying operation particularly Engineering survey.

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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