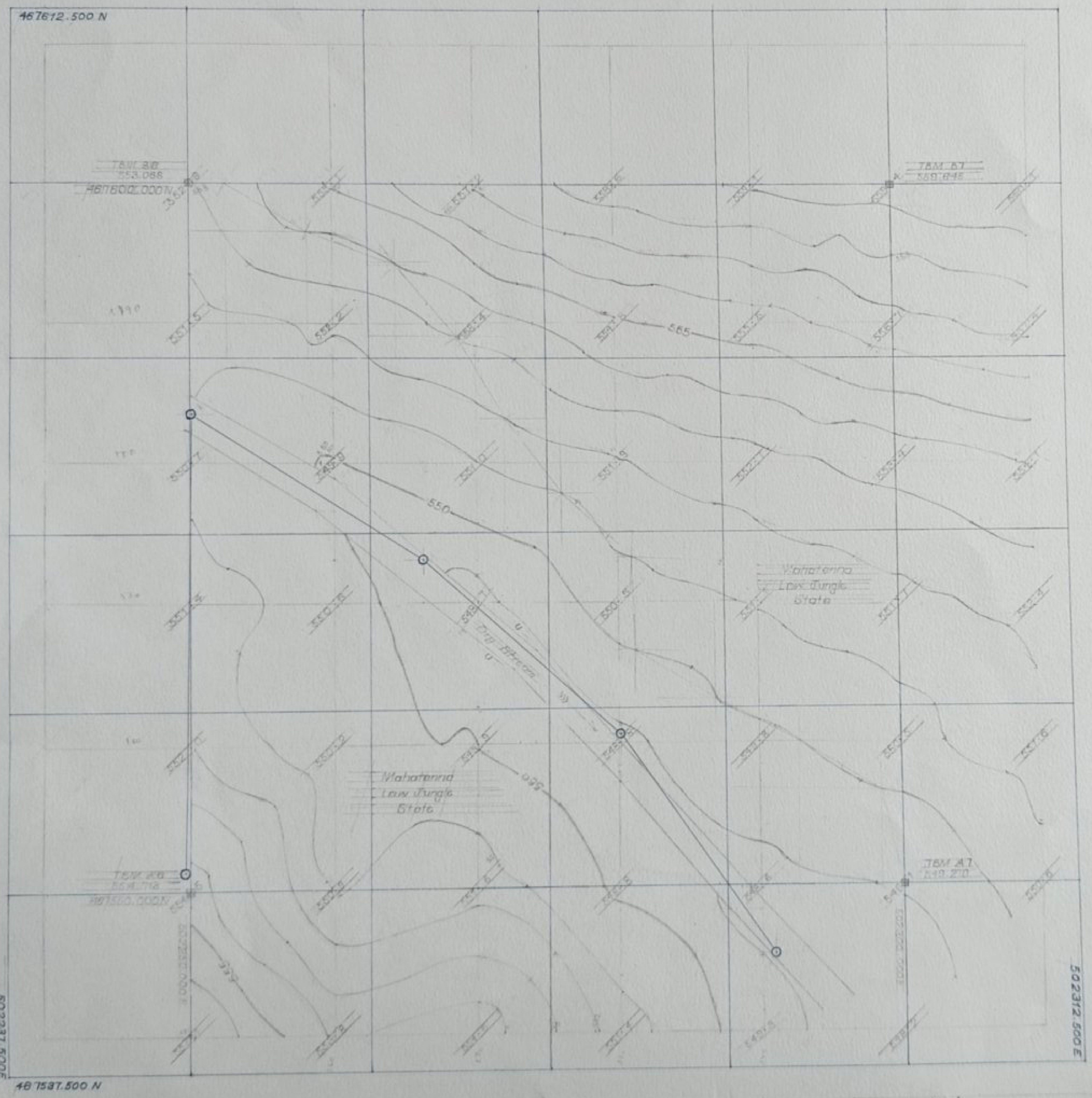
Plan No: 21516G079

FACULTY OF GEOMATICS
SABARAGAMUWA UNIVERSITY OF SRI LANKA

MAHATENNA ENGINEERING SURVEYS 2025 SEPTEMBER

Scale	1:250
Contour Interval	1 m



Village	Mutettuwegama
Minor Division	Kadawata Korale
D.S. Division	Imbulpe
District	Ratnapura
Province	Sabaragamuwa
Field Book No.	2180101
Level Book No.	2151501, 2144081

REFERENCES

T.B.M. — Temporary Bench Mark

Surveyed & Drawn By — A.M. Priyangani, 21BES1518, B.Sc. Survey Student (SUSL)

In Months of September to October 2025

Checked By — Mr. S.S.S.D. Batugamaala, Instructor

Certified By — Dr. K.M.P.M. Priyasara, Supervisor

Date: 2025.10.10

Key Diagram

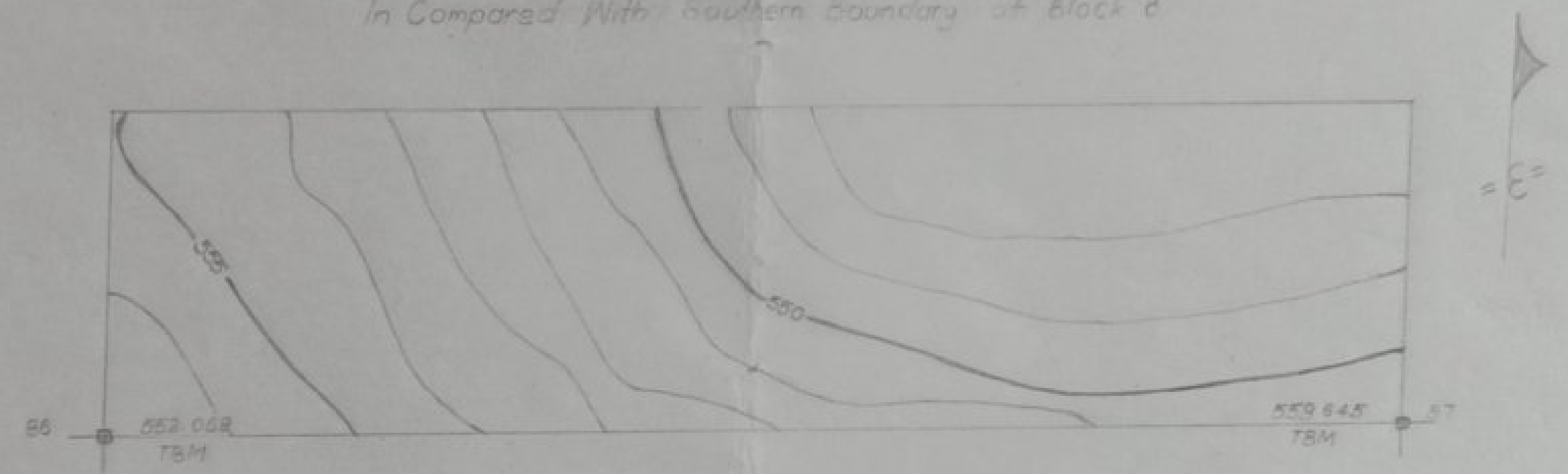
Scale 1:5000 Datum: Mean Sea Level

Grid Checked 2025/09/23 — Detail traverse Checked 2025/09/24 — Details Plotting Checked 2025/09/26 — Contour Checked 2025/10/07

MAHATENNA ENGINEERING SURVEYS 2025 SEPTEMBER

Comparison Sheet

In Compared With Southern Boundary of Block 8



Scale 1:250

Prepared By

27GES1519

B.Sc. Survey Student (SUSL)

05.10.2025

MAHATENNA ENGINEERING SURVEYS 2025 SEPTEMBER

Comparison Sheet

In Compared With Eastern Boundary of Block 10

Scale 1:250

Prepared by
A.M.I.Priyangani
21GES1516
B.Sc. Survey Student (SUSL)

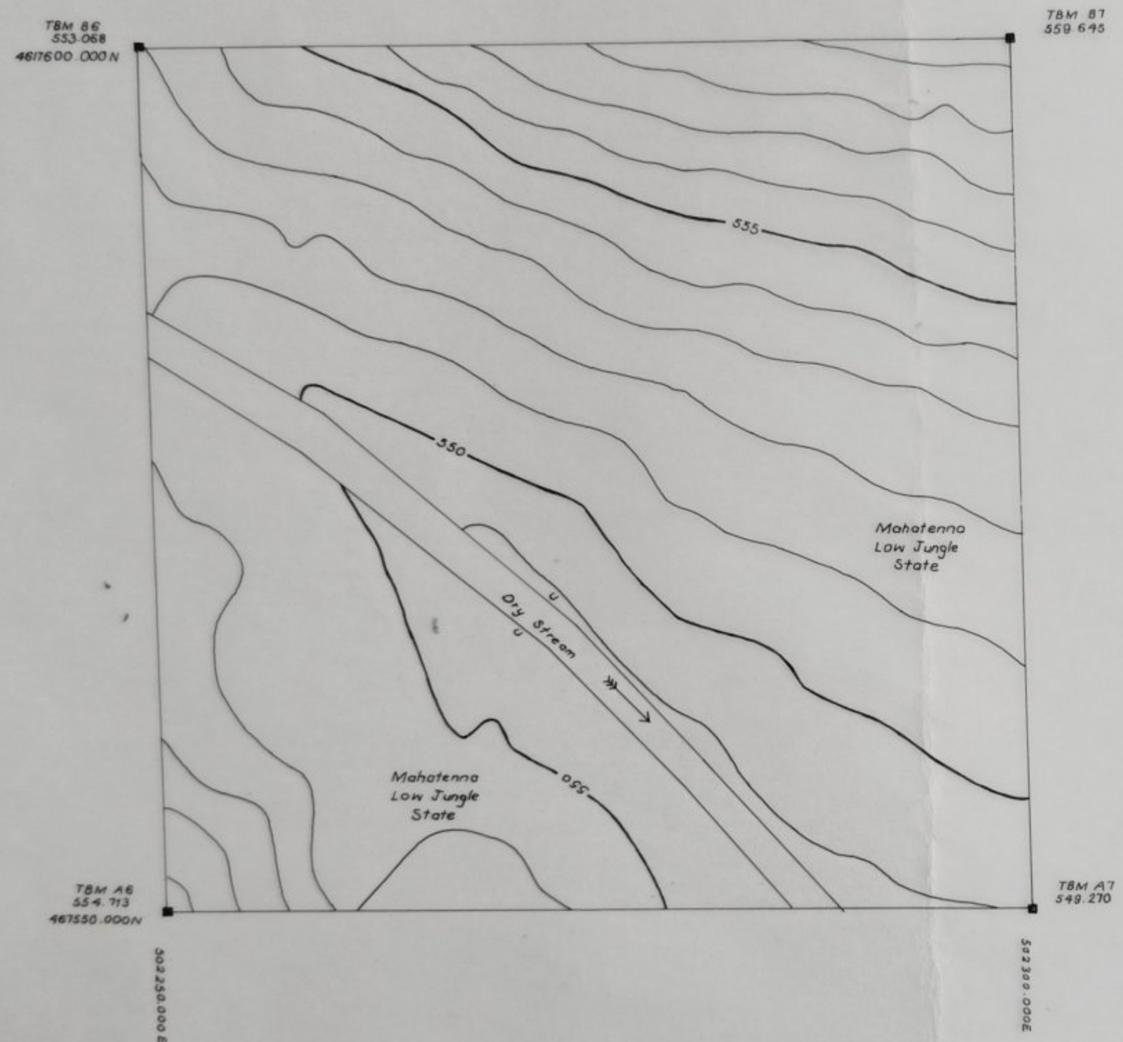
Date 05.10.2025

Diagram No: 211516G0701

FACULTY OF GEOMATICS
SABARAGAMUWA UNIVERSITY OF SRI LANKA

MAHATENNA ENGINEERING SURVEYS 2025 SEPTEMBER

Scale 1:250
Contour Interval 1 m



Village	Muttetturwegama
Minor Division	Kadawala Korale
D.S. Division	Imbulpe
District	Ratnapura
Province	Sabaragamuwa
Field Book No	2160701
Level Book No	21451601, 21144001

REFERENCES

TBM — Temporary Bench Mark
U — Undefined

Surveyed & Drawn By
A.M.I. Priyangani
21GES1516
B.Sc. Survey Student (SUSL)

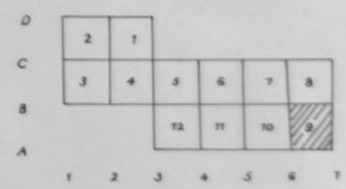
In Months of September to October 2025

Checked By
Mr. B.B.S.D. Batugampala
Instructor

Certified By
Dr. N.M.P.M. Piyasena
Supervisor

Date 2025.10.10

Key Diagram



Scale 1:5000 Datum Mean Sea Level

Report On

LDSP 15

ENGINEERING SURVEYING

Registration Number : 21GES1516

Name : A. M. I. Priyangani

Group No : 07

Submission Date : 16. 10. 2025

FACULTY OF GEOMATICS

CONTENTS

Report On

LDSP 15

ENGINEERING SURVEYING

Registration Number : 21GES1516

Name : A. M. T. Priyangani

Group No : 07

Submission Date : 16. 10. 2025

FACULTY OF GEOMATICS

CONTENTS

INTRODUCTION

Engineering surveying is a specialized branch of surveying dedicated to the collection, analysis and interpretation of spatial data required for the planning, design and execution of engineering projects. Unlike cadastral or land boundary surveys, which are concerned primarily with ownership and legal demarcations, engineering surveying emphasizes precision in topographic representation and control establishment to support the development of infrastructure such as roads, dams, irrigation networks, housing schemes and industrial facilities.

In the present context, engineering surveying serves as the foundation upon which the succeffful completion of civil engineering work is built. Every engineering structure must be correctly located both horizontally and vertically aligned with the terrain, and integrated with the natural and built environment. To achieve this, surveyors collect detailed information about the ground surface, elevations, contours and features, producing accurate engineering maps and contour plans.

In this LDSP 15 task; it involves a systematic workflow beginning with the establishment of horizontal and vertical control networks through traversing and levelling, followed by grid levelling, spot height collection and contour interpolation. The ultimate aim is to prepare a large scale contour map of a designated 50 m x 50 m block, capturing both natural and man-made features for engineering design purposes.

OBJECTIVES

* To establish horizontal and vertical control networks within the designated survey block.

* To perform grid levelling using 10 m spacing and to collect spot heights systematically.

* To interpolate and prepare a detailed contour plan representing some features.

* To prepare professional standard survey documents including plans, progress diagram, bearing diagrams and field records.

* To practice the use of surveying instruments including auto level, total station and associated accessories.

* To get knowledge about how to established the grid corners by using stakeout.

* To learn how to find the reduced level and coordinates of ground point by refereocing the temporary bench marks.

* To get the knowledge about how to calculate the corresponding coordinate by taking several independently measured control traverse line.

USAGES

* Determining road alignments, gradients and earthwork quantities through contour and profile surveys.

* Used to locate reservoir sites, designing irrigation channels, and ensuring efficient drainage through accurate topographic data.

* Used to prepare site plans for housing schemas, industrial zones and public facilities with precise boundary and terrain data.

* Used for mapping flood plains, watershed areas and natural habitats to guide sustainable land use planning.

* For setting out foundations, columns and structural components to ensure buildings and infrastructure are constructed at correct locations and levels.

* Monitoring excavation progress, calculating material volumes, and ensuring safety in excavation works.

* Used for creating maps of natural and manmade features of an area including elevation, contour lines.

EQUIPMENT USED

For Field Work

* Total station with tripod	01
* Target with tripod	02
* Prism pole	02
* Level with tripod	01
* Levelling staves	02
* Steel tape	01
* Linen tape	01
* Hammer	01
* Catties	01
* Ranging poles	03
* Gig Umbrella	01
* Knife	01
* Safety Jackets	11
* Hammer	01
* TBM (Temporary Bench Marks)	10
* Cement pickets	15
* wooden pickets	10
* slatted pickets	20
* Crow Bar	01

For Office Work

* Science book	01
* Calculator	01
* Coordinate sheets	02
* Tertiary traverse sheets	12
* Digital Data Collection Sheets	02

METHODOLOGY

FIELD WORK

* The instruments were taken from the store according to the task card instructions.

* Before entered the field, equipments were checked whether they were in good condition.

* The reconnaisence survey was done along the control network TT4. (SUSL R - NSG 2)

* According to the task card, SUSL-R was found by using "place" application software. SUSL-R coordinates were given by approximately.

* After that traverse path from SUSL-R to NSG-2 was cleared. (TT4)

* The horizontal and vertical control network were done simultaneously by seperate groups.

* Then pickets were established by considering the intervisibility along the main traverse.

* Cement pickets were used for this.

* Dead measurements were taken in the stations where cement pickets were established and recorded in the field book.

OFFICE WORK

* First tertiary traverse sheets were completed using calculations.

* Then the mean, final mean, included angle of the horizontal angle and mean distances were calculated.

* The fore bearing of the SUSL 06 was calculated using the given coordinates.

* Then included angle of the SUSL 05 was added to calculated bearing of SUSL 06.

* If the calculated bearing was,

$> 180^\circ \longrightarrow 180^\circ$ was subtracted

$< 180^\circ \longrightarrow 180^\circ$ was added

$> 540^\circ \longrightarrow 540^\circ$ was subtracted.

* Using same method, all the bearings were calculated up to NSG 01.

* Then the angular misclosure was checked with calculated bearing and correct bearings with coordinates.

* The error was less than 3 minutes it was 18 seconds. Therefore error was distributed among all bearing and adjusted bearing was obtained.

PLAN WORK

* First, plan sheet and all necessary equipments were taken from the store.

* Then the rough side was selected and 1 cm margin was drawn using rolling ruler, beam compass and steel ruler.

* The plan drawing part and lettering sections of the plan sheet were seperated into two sections.

* Then choosed the 1 : 250 scale for drawn the plan.

* After that 5 cm grid lines were drawn using the plotting scale, rolling ruler and steel ruler.

* Then grid lines and coordinates of the grid corners were inked.

* Next, relevant to the main grid lines, 4 cm grid lines were drawn.

* Then detail traverse picket points were marked by using the coordinates.

* The detail traverse was inked by cyan blue color.

* After that dry stream details were plotted using coordinates of dry stream details that collected.

DISCUSSION

Engineering surveying provides the fundamental data acquired for the planning, design and execution of engineering projects such as roads, building and water supply schemes. By furnishing accurate information on topography, boundaries and elevations, surveying enables engineers to design safe, functional and cost effective structures. Using modern instrument such as total stations, GNSS receivers and levels. Surveyors are able to establish control networks, determine precise locations and monitor construction progress to ensure projects.

Our survey fieldwork was carried out in a block that presented several challanges including steep terrain, dense jungle with thorny bushes, slope, dry stream and exposure to wind. Prior to starting the survey, a reconnaissance was conducted to identify a suitable traverse line, locate control points and determine potential obstacles. Cement pickets were used as control point station because of their stability and durability, with holes dug sufficiently deep to prevent displacement.

During traverse measurement, the two zero method was adopted to improve accuracy. Each traverse line was observed in both forward and backward directions, reducing errors due to instrument mis-centering or sighting problems. This approach ensured greater reliability of traverse closure.

DOCUMENT ANNEXED

Field Book No : 21G0701

Level Book No : 21151601 , 21144001

Plan Number : 211516G08

Reference : Task card
Lecture Notes

Diagram Number : 211516G01

Signature :

Name : A. M. I. Priyangani

Index No : 21GES1516

Position : B.Sc. Survey Student (SUSL)

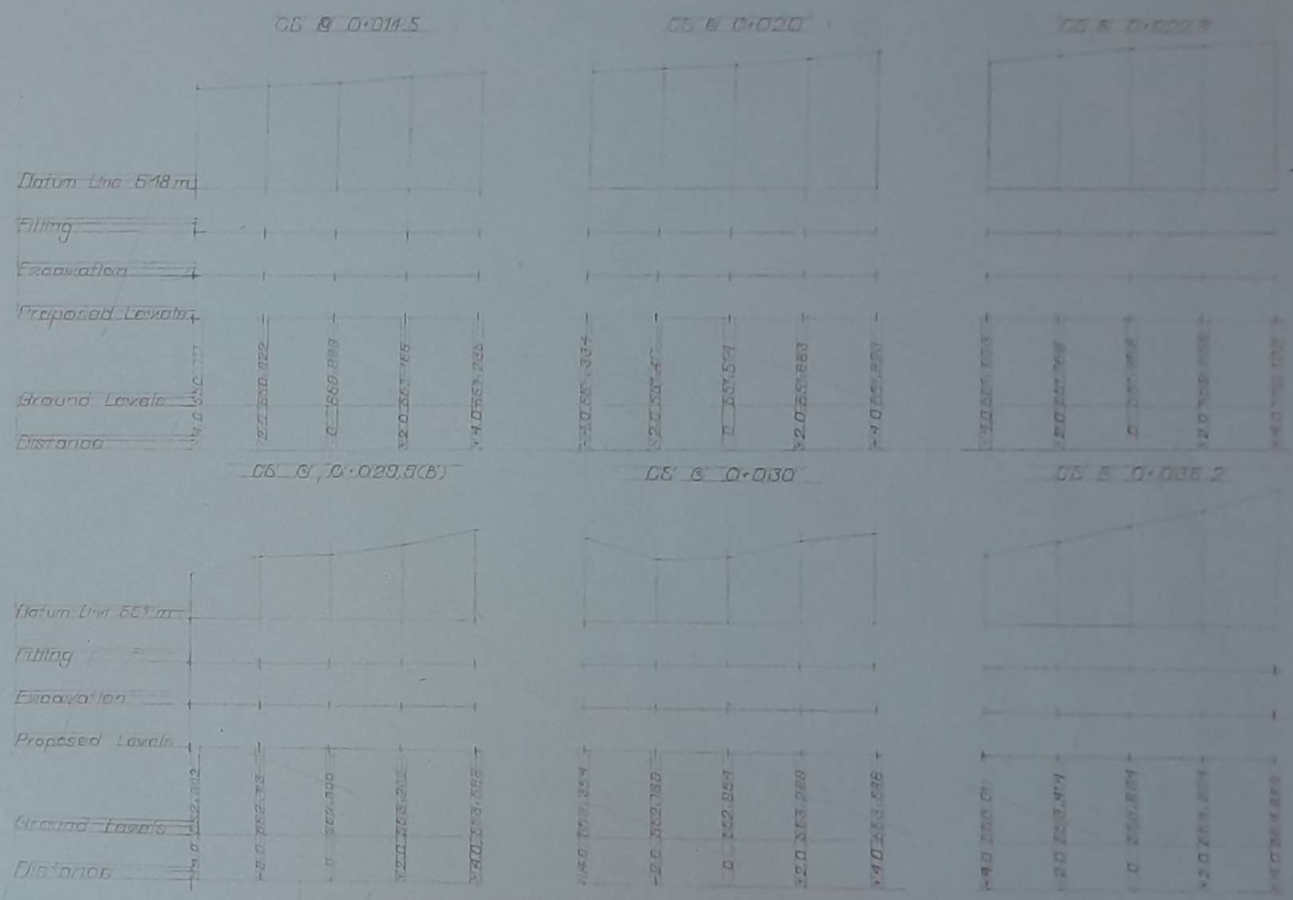
Date : 16. 10. 2025

Plan No : 2015/E/0709

FACULTY OF GEOMATICS
SABARAGAMUWA UNIVERSITY OF SRI LANKA

SETTING OUT SURVEYS

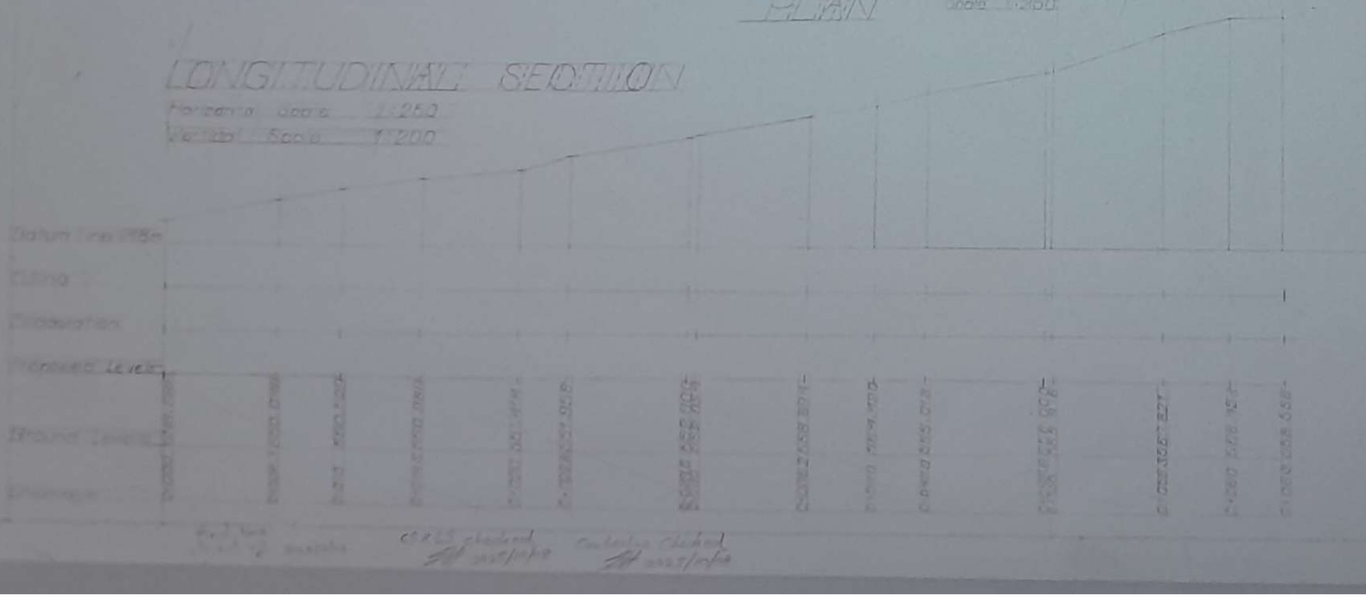
PLAN Scale 1:250



CROSS SECTION Horizontal Scale 1:125
Vertical Scale 1:125

LONGITUDINAL SECTION

Horizontal Scale 1:250
Vertical Scale 1:200

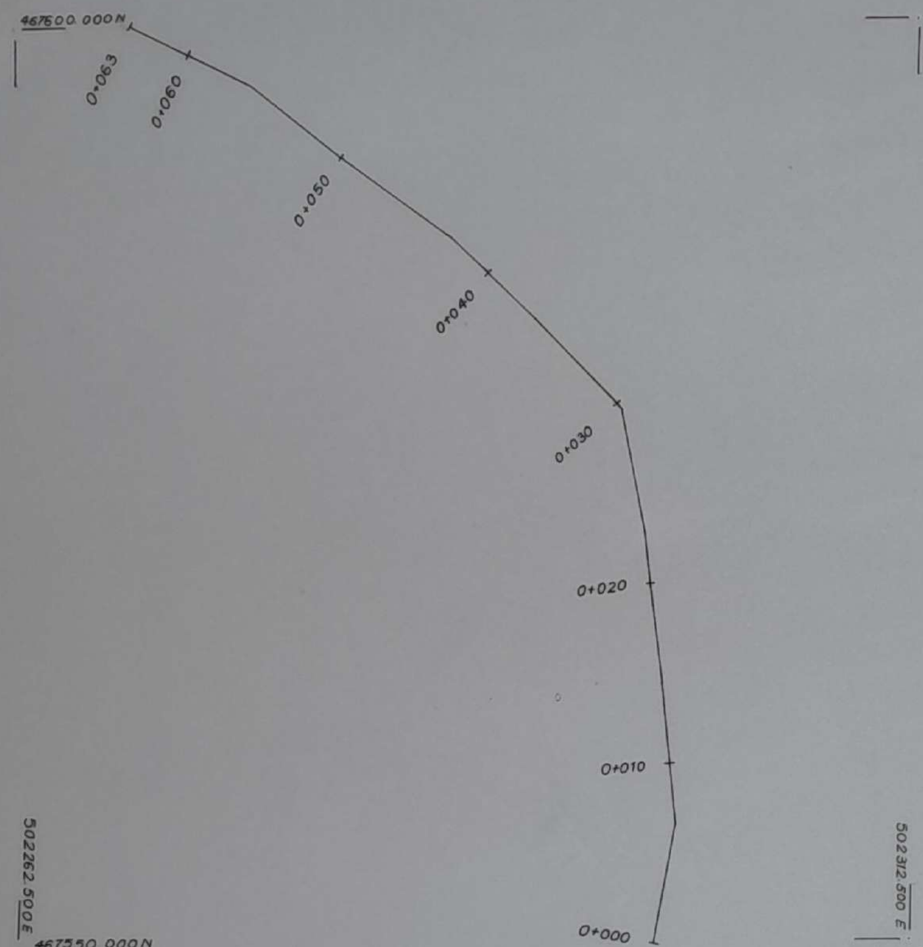


Field Book No
Level Book No
Surveyed
Drawn By
In Month of October 2020
Checked By
Certified By
Date

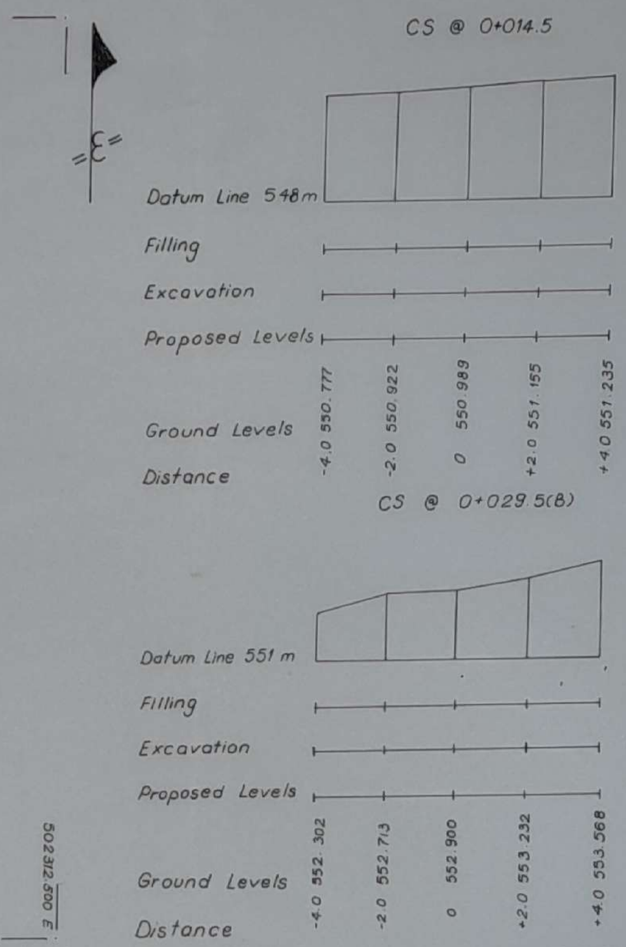
Diagram No: 211516G0702

FACULTY OF GEOMATICS
SABARAGAMUWA UNIVERSITY OF SRI LANKA

SETTING OUT SURVEYS



PLAN Scale 1:250

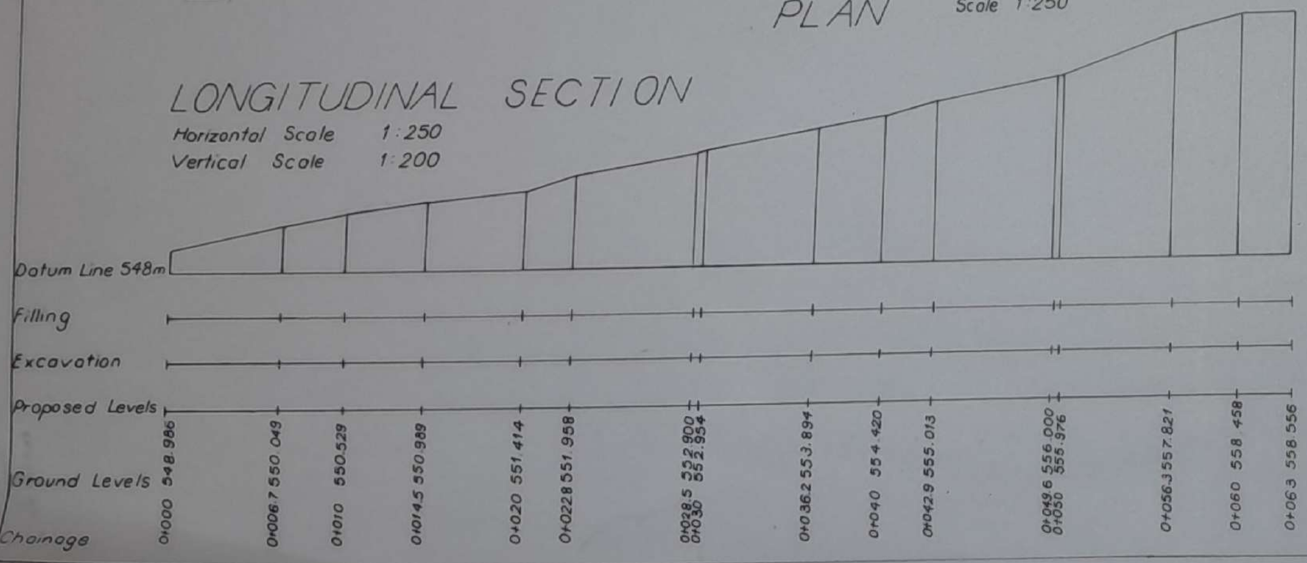


CROSS SECTION

Horizontal Scale 1:125
Vertical Scale 1:125

LONGITUDINAL SECTION

Horizontal Scale 1:250
Vertical Scale 1:200



Field Book No	21G0701
Level Book No	211516 01
Surveyed & Drawn By	A.M.I. Priyangani 21GES1516 B.Sc. Survey Student (SUSL)
In Month of	October 2025
Checked By	for Mr.B.B.S.D.Batugampala Instructor
Certified By	Dr.N.M.P.M.Piyasena Supervisor
Date	15.10.2025

Report On

LDSP 16

SETTING OUT SURVEY

Registration Number : 21GES1516

Name : A.M.T. Priyangani

Group No : 07

Submission Date : 16.10.2025

FACULTY OF GEOMATICS

CONTENTS

INTRODUCTION

The setting out survey is one of the most essential stages in engineering construction as it serves as the practical process of transferring design information from plans, drawings or digital models to the ground to enable accurate construction. While general surveying is the process measuring and mapping existing features of the terrain, setting out performs the reverse function by physically locating proposed structures in their correct horizontal and vertical positions on site.

The main objective of setting out surveys is to ensure that all components of a project such as buildings, roads, railways, highways and pipelines are constructed precisely according to design coordinates, elevations and dimensions. Setting out are vital for categories of all construction work, from small scale housing developments to large scale infrastructure projects such as highways, tunnels, railways and bridges.

In modern engineering projects, setting out is typically conducted by qualified surveyors or site engineers using advanced equipment such as total stations, GNSS receivers, digital and automatic levels. These instruments allow for high precision measurement of distances, angles and elevations, which are essential for transferring design data accurately to the ground.

OBJECTIVES

* To set out a center line of a road for a gradient according to the contour plan drawn.

* To transfer design details such as coordinates from plans and drawings accurately on to the ground.

* To learns what are the requirements and basic regulations for setting out the road.

* To take the idea about horizontal control, vertical control and vertical alignment.

* To learn about how to take cross sections and longitudinal sections in the field.

* To establish correct positions, levels and alignments for construction work.

* To check and verify the accuracy of construction during and after completion.

USAGES

* Used in road construction to set out centerlines, curves, gradients and boundaries.

* Used to locate foundation lines, column positions and wall alignments in building.

* Used to ensures stability and structural integrity by precisely identifying the locations of excavation for building foundation.

* Used in dam and canal projects to ensure accurate alignment and level control.

* Used for setting out boundaries in land subdivision and site development.

* For minimizes building mistakes that can cause structural instability, enhancing the project's overall safety.

EQUIPMENTS USED

Field Work	
Total station with tripod	01
Targets with tripod	02
Prism with pole	01
Auto level with tripod	01
Levelling staff	04
Steel tape	01
Gig Umbrella	01
Linen tape	01
Crow bar	01
Knife	01
Catty	01
Mallet	01
Hammer	01
Wooden pickets	10
Slatted pickets	10
Temporary Bench Marks	02
Office Work	
Coordinate Sheet	01
Scientific calculator	01
Plan Work	
Plan sheet	01
Tracing sheet	01
Rolling ruler	01
Parallel Ruler	01
Beam Compass	01
Plotting Scale	01
Steel Ruler	01
Rotring Pen	01
Paper Weights	04

METHODOLOGY

FIELD WORK

* First, instruments were taken from the store according to the given task card guidance after the office work.

* Equipments were inspected to make sure it was in good condition.

* Then reconnaisance survey was done for approximately identified the starting point, direction of the road and ending point of the road according to the Engineering Surveys plan (Plan No : 211485GO708)

* After that coordinates of the all turning points, starting point and end point of the centerline of the road was keyin in to the total station.

* A seperate traverse was conducted, while the centerline points of the road were simultaneously staked out at various positions along the road.

* Then the detail traverse line was started.

* Firstly, instrument was setup at ৸৪ and two targets were placed on (set on) ৸৭ and check on ৸৯.

* Two targets were observed and all observations were were recorded in the digital data collection sheet and field book (21GOTO1).

OFFICE WORK

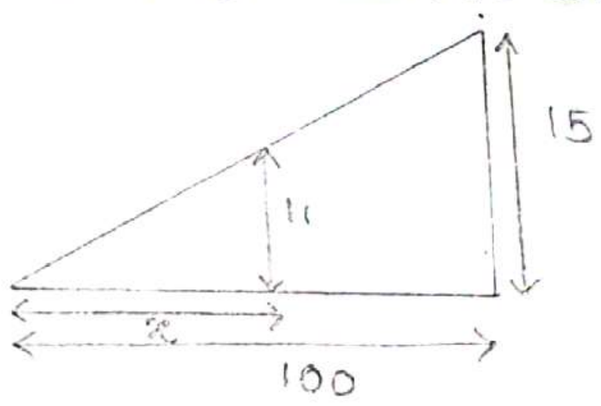
* Office work was started before the field work.

* So, first studied well how the contours were spread of the drawn plan during the engineering surveys.

* The contour distribution was considered and a gradient was decided to design the road.

* There 15 % gradient was used to design the road.

* The minimum horizontal distance was calculated based on 1 m contour interval and relevant gradient.



$$\frac{1}{15} = \frac{x}{100}$$

$$x = 100/15 = \underline{\underline{6.67\ m}}$$

* The engineering surveys plan was drawn in 1 : 250 scale. So, the minimum distance was calculated with the relation to that scale.

1 : 250

1 mm ⟶ 4 mm

6.67 ⟶ 6.67 × 4 = <u>26.68 mm</u>

* The a start point and end point were decided to design the road, and drawn road in Engineering surveys plan using beam compass.

* The one of the designed centerline points chainages, coordinates were extracted from the Engineering Surveys plan (Plan No : 211485G0708) and recorded

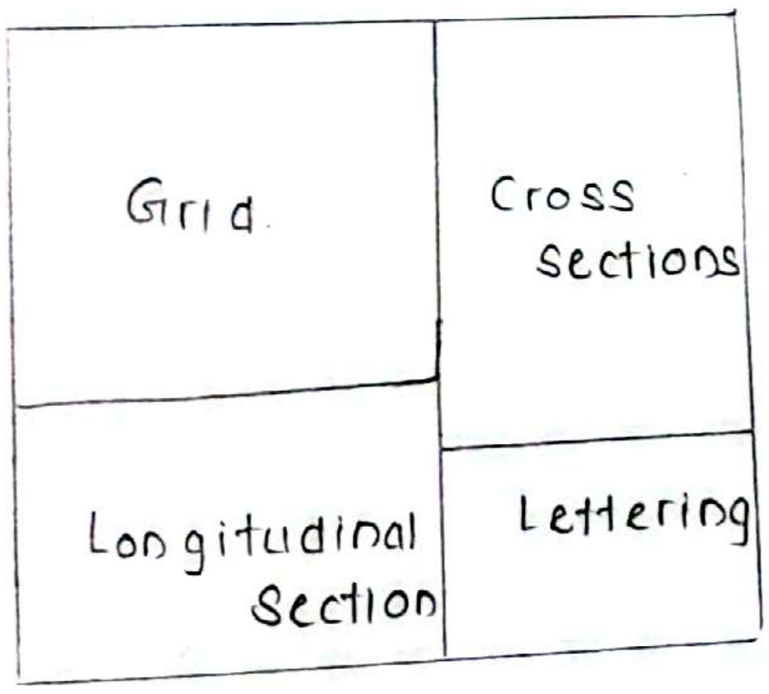
PLAN WORK

* First, plan sheets and all equipments that used for plan work were taken from the store.

* The rough side was selected by touching the plan sheet.

* On the plan sheet a 1 cm margin was drawn using rolling ruler, steel ruler and beam compass.

* Then the plan sheet was divided into four sections,
  - Grid
  - Longitudinal Section
  - Cross section
  - Lettering part



* The grid was drawn on the plan sheet according to the centerline of the road on the engineering surveys plan and traverse line.

* For the plan 1 : 250 scale was choosed.

* Grid lines (4 x 4) were drawn using plotting scale, rolling ruler and steel ruler.

DISCUSSION

The setting out surveys forms a critical part of engineering surveying, involving the transfer of the designed alignment from the plan to the actual ground surface. It ensures that the designed features such as roads, buildings or drainage lines are accurately located according to the plan.

It required integrating the concepts of horizontal and vertical control, traversing, levelling and stakeout procedures to ensure that every point along the designed alignment corresponded accurately with the engineering plan. This task involved establishing a designed road on a steep and irregular terrain covered with thorny bushes and large trees, which difficulty to both observation and measurement. Despite these challanges, careful planning ensured a successful completion of this setting out process.

Before the field work commenced, office preperation was essential. The design of the road alignment was completed based on the contour map obtained from the Engineering surveys plan. Each member of the group designed a road in their Engineering survey plan from all those, a road that is easy to setting out and travels in a clear area, without narrow bends was choosen for setting out works.

In Engineering surveys plan, contour pattern showed steep terrain, and therefore an initial 15% gradient was selected for the designed road. In areas

COORDINATES OF THE ROAD
PLAN NO :211516G0709

Chainage	Northing Coordinate (m)	Easting Coordinate (m)	Reduced Level
0+000	467550.000	502300.000	549.100
0+006.7	467556.500	502298.800	550.000
0+010	467558.200	502295.800	550.400
0+013.4	467560.000	502292.800	550.000
0+020	467562.900	502287.000	550.000
0+020.1	467563.000	502286.900	550.000
0+026.8	467566.500	502281.200	551.000
0+030	467574.700	502279.300	551.500
0+033.5	467577.800	502276.000	551.000
0+040	467583.600	502272.000	552.000
0+040.2	467583.200	502272.000	552.000
0+046.9	467589.100	502268.700	553.000
0+050	467591.500	502266.700	553.500
0+053.6	467594.200	502264.400	554.000
0+060	467596.400	502258.600	554.000
0+060.3	467596.500	502258.200	554.000
0+067.0	467600.000	502254.800	553.200

DOCUMENT ANNEXED

Field Book No : 21GOT01

Level Book No : 21151601

Plan Number : 211516GOT09

Diagram Number : 211516GOT02

References : Task card
A textbook of Surveying and Levelling (R. Agor)
Surveying - by B.C. Punmia

Attachment : Coordinates and the Reduced Level of setting out Road

Signature :

Name : A.M.I. Priyangani

Index No : 21GIES1516

Position : B.Sc. Survey Student (SUSL)

Date : 16.10.2025