

UNIVERSITI TEKNOLOGI MARA

**THE ESTIMATION OF
SOIL SUBSURFACE TYPES AND
ANALYSIS FOR EFFECTIVENESS
OF GPR PENETRATION**

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Thesis submitted in fulfillment
of the requirements for the degree of
Bachelor of Surveying Science & Geomatics

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

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ABSTRACT

The work of detecting buried underground utilities had become one of the most important part in every construction project in order to avoid damaging any existing buried underground utilities. The condition of the buried underground utilities and the soil subsurface conditions can be observed by correctly interpret the radargram image and the textural features contained in them. Due to the nature of the GPR signal, the radargram image produced can be affected by many factors especially the types of soil subsurface in the area where the underground utilities detection are done. This thesis describes a research project done to estimate, identify and analyse the types of soil subsurfaces in three different area in order to assess the GPR penetration capabilities in each of them. Furthermore, this research also involved the use of two GPR antenna frequency of 250 MHz and 500 MHz. A series of scanning are taken at each of the study area with different depth settings, where the depth is set to 3 m and 5 m when using antenna frequency of 500 MHz and 10 m when using antenna frequency of 250 MHz. This are done to compare the depth penetration of the GPR and to see how different antenna frequency is affected in different types of soil subsurface. The processed radargram image are classified according to their textural features and geometry pattern of the profiles by visual interpretation of the interpreter. From the interpretation made, the radargram were manage to be classified into six radarfacies where five of them are interpreted as types of soil subsurface and the other one as the attenuation of the GPR signal due to energy losses producing ambiguity image. Based on the analysis, the percentages of radarfacies contained in each of the study area, how each of the radarfacies affect the average minimum and maximum depth penetration of the GPR, and assessment on the GPR penetration capabilities on different types of soil subsurfaces are obtained. The results presented in this thesis conclude that the types of soil subsurface need to be considered and taken into account when doing GPR scanning as they affect the depth penetration and the radargram image produced.

TABLE OF CONTENT

	Page
CONFIRMATION BY PANEL OF EXAMINERS	ii
AUTHOR'S DECLARATION	iii
SUPERVISOR'S DECLARATION	iv
ABSTRACT	iv
ACKNOWLEDGEMENT	vi
TABLE OF CONTENT	vii
LIST OF TABLES	x
LIST OF FIGURES	xi
LIST OF SYMBOLS	xiv
LIST OF ABBREVIATIONS / NOMENCLATURE	xv
CHAPTER ONE: INTRODUCTION	1
1.1 Research Background	1
1.2 Research Gap	3
1.3 Problem Statement	5
1.4 Research Aim & Objectives	5
1.5 Research Questions	6
1.6 Research Methodology	6
1.7 Study Area	7
1.8 Expected Outcome	8
1.9 Significance of Study	8
1.10 Summary	9
CHAPTER TWO: LITERATURE REVIEW	10
2.1 Introduction	10
2.2 History of GPR	10
2.3 Overview of GPR Techniques	11
2.4 Basic GPR Concept	12

2.5	GPR Method	14
2.6	GPR Limitation	16
2.7	Properties of Material	19
2.8	GPR Signal Signature	21
2.9	Interpretation of GPR Image by Radarfacies	233
2.10	Summary	24
CHAPTER THREE: RESEARCH METHODOLOGY		25
3.1	Introduction	25
3.2	Research Methodology Diagram	25
3.3	Details of the GPR Equipment Used	28
3.4	Data Acquisition	30
	3.4.1 Site Preparation	30
	3.4.2 Depth Calibration	33
	3.4.3 MALA XV Monitor Settings	334
	3.4.4 Data Collection	39
3.5	Data Processing	42
	3.5.1 Data Processing Using Reflex2DQuick	42
3.6	Determining Different Types of Soil Subsurface	50
	3.6.1 Forming Layers	50
3.7	Determining Depth Penetration from Radargram Image	52
3.7	Summary	53
CHAPTER FOUR: RESULT AND ANALYSIS		54
4.1	Introduction	54
4.2	Result from Filtering and Image Enhancement	54
	4.2.1 Area 1: On Road Surface	55
	4.2.2 Area 2: On Normal Ground	56
	4.2.3 Area 3: On Soft Ground	57
4.3	Interpretation of the GPR Images	58
	4.3.1 Layers of Area 1: On Road Surface	60
	4.3.2 Layers of Area 2: On Normal Ground	65