

TABLE OF CONTENTS

Contents	Page
Abstract (in Thai)	iii
Abstract (in English)	iv
Acknowledgements	v
Table of contents	vi
List of Tables	viii
List of Figures	ix
Chapter	1
1. Introduction	1
1.1 Vientiane basin	1
1.2 Location, topography and climate of the study area	1
1.3 Geology of the study area	3
1.4 Geophysical measurement	7
1.5 Literature review	8
1.6 Objectives of the study	15
2 Research methodology	16
2.1. Equipment	16
2.1.1. Electrical resistivity data acquisition	16
2.1.2. Gravity data acquisition	17
2.1.3. Density of rock determination	18
2.1.4. Other equipment and materials	18
2.2. Geophysical principles	18
2.2.1. Electrical resistivity method	19
2.2.2. Gravity method	21
2.3. Data acquisition	22
2.3.1. Electrical resistivity data acquisition	22
2.3.2. Gravity data acquisition	22
2.4. Data processing	28
2.4.1. Electrical resistivity data processing and interpretation	28
2.4.2. Altimeter data processing	30

2.4.3. Gravity data processing	31
2.5. Density of rock samples determination	38
3 Results and discussions	40
3.1. Density of rock samples	40
3.2. Bouguer map of the study area	42
3.3. Gravity modeling of Vientiane basin	45
3.4. Electrical resistivity surveys in Xaithani district	54
3.4.1. Comparison of resistivity models with geological logs	59
3.4.2. Potential area for groundwater in the study area	61
4 Conclusion and recommendation	63
References	65
Appendices	70
A Gravity data	71
A1 Gravity data processing	72
A2 Density data of rock samples	76
A3 Gravity model data	77
B Resistivity data	83
B1 Resistivity field data	84
B2 Resistivity sounding curves	94
Vitae	99

LIST OF TABLES

Table		Page
1.1	Stratigraphy of Khorat Plateau and Vientiane basin	5
2.1	Resistivities of some common rocks and other materials	19
2.2	Densities of some common rock types	21
2.3	Example of data sheet for resistivity sounding measurement	24
2.4	Example of data sheet for gravity measurement	27
2.5	Example of data sheet for average elevation of topography	28
2.6	Example of elevation values of gravity stations from calculation	31
2.7	Calibration factor of Lacoste & Romberg gravimeter model G-565	32
2.8	Examples of drift correction of observed gravity data	33
2.9	Terrain correction values of zone B to E	36
2.10	Example of gravity values due to elevation of topography	37
2.11	Examples of Absolute Bouguer gravity anomaly	37
2.12	Example of data sheet for density of rock samples	39
3.1	Average density of rock samples	40
3.2.	The interpret resistivity models of sounding points	57

LIST OF FIGURES

Figure	Page	
1.1	Location map of the study area	2
1.2	Topographic map of the study area	3
1.3	Geological map of the study area	4
1.4	Location of the Khorat and the Sakon Nakhon basins in the Khorat Plateau	9
1.5	Minerals deposit of Indochina	10
2.1	Resistivity meter, ABEM Terrameter SAS 1000	16
2.2	Lacoste & Romberg gravimeter model G-565	17
2.3	(a) AMP altimeter model MDM-5	18
	(b) GPS Trimble model Basic Pathfinder	18
2.4	Schlumberger electrodes configuration	20
2.5	Electrical resistivity surveys in Xaithani district	23
2.6	Example of the diagram for loop gravity measurement	26
2.7	Gravity surveys and geological sites surveys in Vientiane basin	26
2.8	Locations of gravity and sounding stations	27
2.9	Resistivity curve matching technique for determining resistivity model of the ground at each sounding point	29
2.10	The free-air correction for an observation at a height (h) above datum	34
2.11	The Bouguer correction	35
2.12	The Terrain correction	36
3.1	Locations of rock samples on geological map of Vientiane basin	41
3.2	Density distribution of Cretaceous sandstone	41
3.3	Contour map of Bouguer anomalies overlies on topographic map of Vientiane basin	42
3.4	Contour of Bouguer anomalies overlies on geological map of Vientiane basin	44
3.5	Bouguer anomaly contours and locations of gravity profiles	45
3.6	Geological cross section through Vientiane basin	46

LIST OF FIGURES (CONTINUED)

	Page
3.7 (a) Surface geology in vicinity of line AA'	47
(b) Gravity anomalies on line AA'	
(c) Geophysical model on line AA'	
3.8 (a) Surface geology in vicinity of line BB'	48
(b) Gravity anomalies on line BB'	
(c) Geophysical model on line BB'	
3.9 (a) Surface geology in vicinity of line CC'	49
(b) Gravity anomalies on line CC'	
(c) Geophysical model on line CC'	
3.10 (a) Surface geology in vicinity of line DD'	51
(b) Gravity anomalies on line DD'	
(c) Geophysical model on line DD'	
3.11 (a) Surface geology in vicinity of line EE'	52
(b) Gravity anomalies on line EE'	
(c) The first geophysical model on line EE'	
(d) The second geophysical model on line EE'	
3.12 Contour map of the depth to basement of Vientiane basin	54
3.13 (a) The first type of VES-curves of Xaithani district	55
(b) The second type of VES-curves of Xaithani district	55
3.14 (a) Apparent resistivity maps of Xaithani district at half current electrode spacing (L) of 1.5 m, 10 m, 20 m, 30 m, and 45 m	56
(b) Apparent resistivity maps of Xaithani district at half current electrode spacing (L) of 60 m, 90 m, 150 m, 225 m, and 350	56
3.15 (a) True resistivity contour maps of Xaithani district at depth of 0 m, 5 m, 10 m, 15 m, and 20 m	58
(b) True resistivity contour maps of Xaithani district at depth of 40 m, 60 m, 80 m, 100 m, and 150 m	58
3.16 Contour map of the depth to the top of the conductive layer	58
3.17 Well (Lk-18) correlation of VES-result at sounding point S-26	59

3.18	Well (Lk-21) correlation of VES-result at sounding point S-27	60
3.19	Resistivity contour maps correlated to TDS values	60
3.20	Resistivity contour maps with contour depth to the bottom layer	62