Electrical Resistivity Tomography for Detecting Geological Structure of Fluoride Contaminated Groundwater Resource at Ban Thi District, Lamphun Province

Pichchapa Pitchayawiwat 650510421
Advisor: Assistant Professor Dr. Suwimon Udphuay

Department of Geological Sciences, Faculty of Science, Chiang Mai University.

ABSTRACT

Groundwater contamination is a critical issue affecting community health, particularly in areas where geological conditions favor the dissolution of fluoride-bearing minerals. This study focuses on Ban Thi District, Lamphun Province, where such risks are prevalent. A 2D electrical resistivity tomography (ERT) survey was conducted to investigate subsurface structure within the aquifer system, using a dipole-dipole electrode configuration with 5 meter spacing. Data were collected along 4 survey line: Line 1 extended 400 meters, while Line 2 3 and 4 each extended 500 meter. The datasets were processed with AGI EarthImager™ 2D software to generate ERT profiles of the subsurface. Results suggest that zones of low resistivity may correspond to groundwater-bearing formations potentially affected by fluoride contamination. These anomalies are correlate with geological features such as sediment layers and fracture systems within the subsurface sediments. The findings provide essential insights for groundwater resource management and monitoring of fluoride contamination in the study area.

INTRODUCTION

The study of geological structures in groundwater areas is important for understanding the problem of fluoride contamination in groundwater, which may result from the weathering of rocks. Geological structures such as faults and fractures can influence groundwater movement. In addition, hydrothermal processes may also play a role in transporting fluoride into the groundwater system. The electrical resistivity survey method is an effective tool for interpreting geological structures. The results of this study will help identify the geological structures of groundwater resources in Ban Thi District, Lamphun Province, and can serve as fundamental information for planning and effective management of groundwater resources in the future.

OBJECTIVE

To detect subsurface geological structures in Ban Thi District, Lamphun Province using 2D ERT method.

STUDY AREA

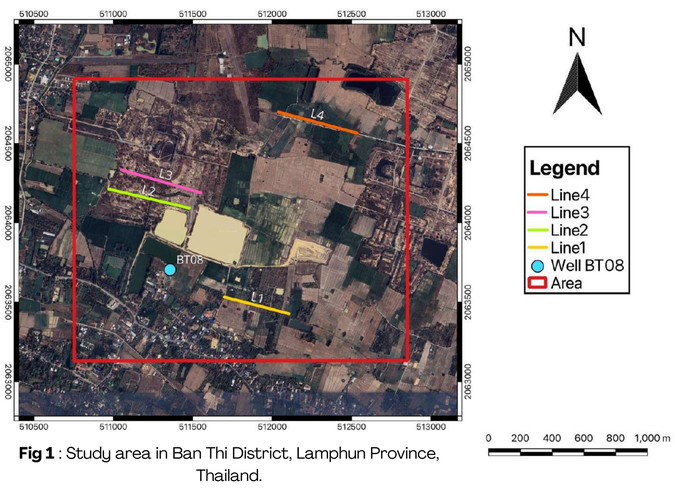


Fig 1 : Study area in Ban Thi District, Lamphun Province, Thailand.

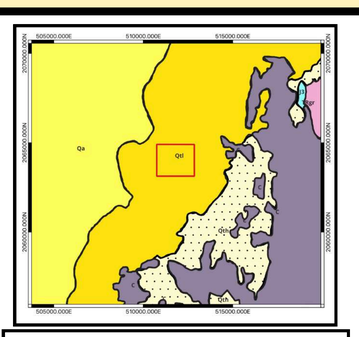
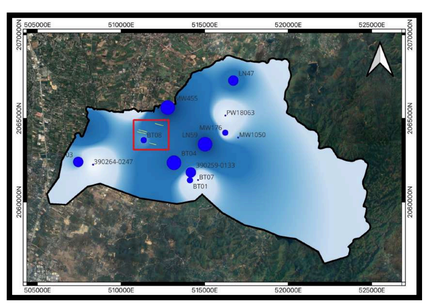


Fig 2 : Lithology of the study area characterized by low river terrace deposits.



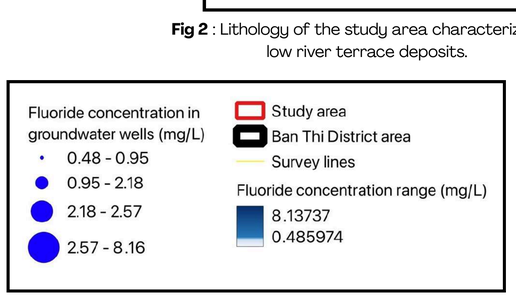


Fig 3 : Fluoride concentration in each groundwater well.

CONCLUSIONS

The survey area consists of a clay layer near the surface and underlying gravelly sand sediments, which have the potential to act as an aquifer. In some areas, subsurface structures that may control groundwater flow were identified. The variations in electrical resistivity values are likely associated with faults or rock fractures.

METHODS

Step : 1

Field Survey and Data Collection

- 4 survey lines were arranged.
- The lengths of the survey lines were 400 and 500 meters.
- The dipole–dipole array was used.
- The spacing between electrodes was 5 meters.
- ABEM TERRAMETER SAS 4000 resistivity meter was employed.

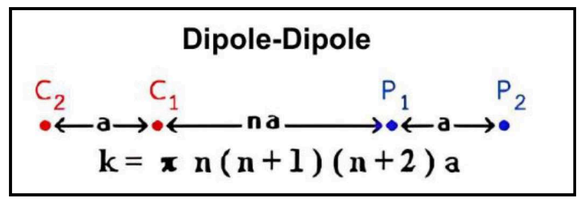


Fig 4 : Dopole-Dipole array.



Fig 5 : Photos from the field survey

Step : 2

Data Processing

- Collected apparent resisของvtivity data were converted and formatted before inversion.
- The data were processed using AGI EarthImager™ 2D inversion software to transform apparent resistivity values into the true resistivity of subsurface layers.

Step : 3

Data Interpretation

- The processed results were presented as subsurface resistivity cross-section images, which were used to analyze and interpret the geological structures beneath the ground surface.

RESULTS

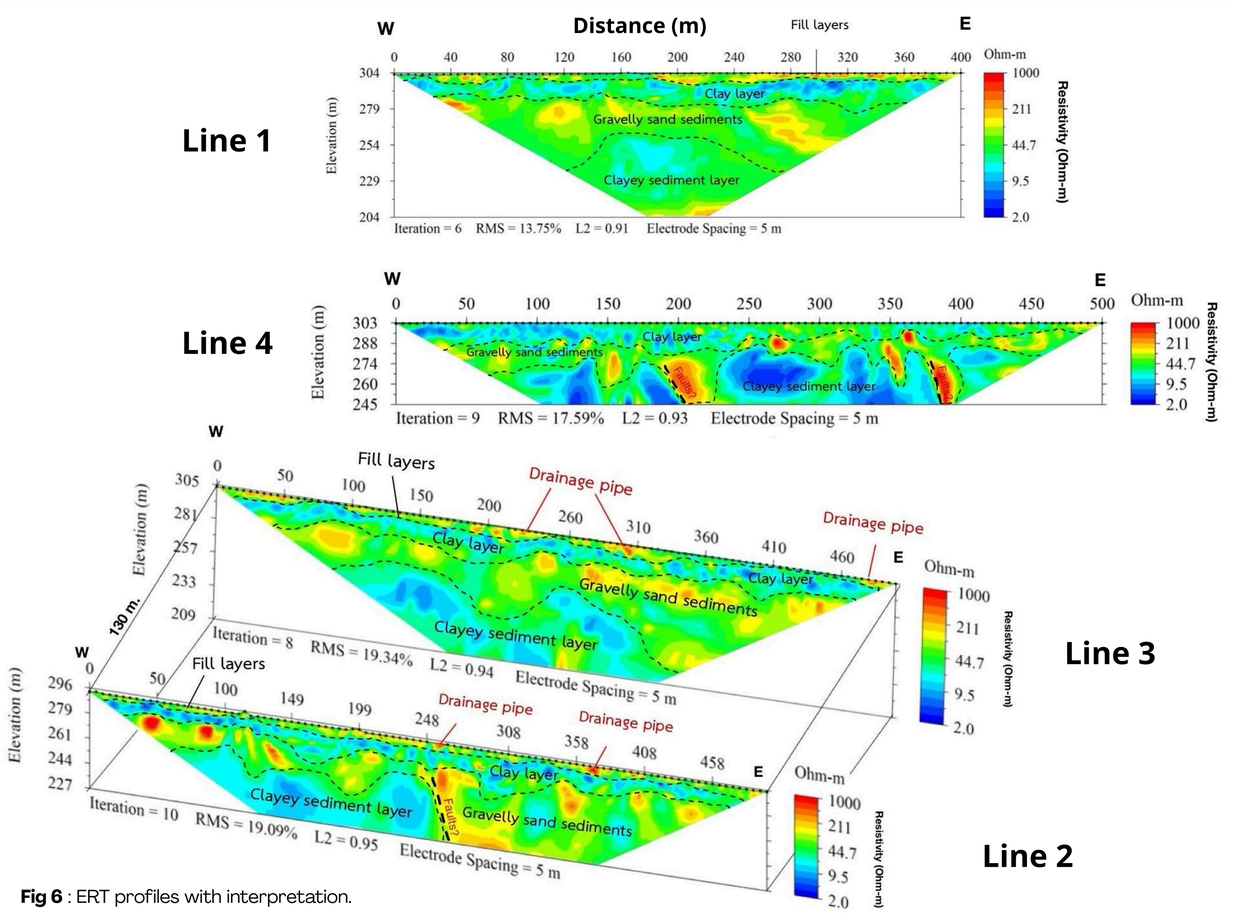


Fig 6 : ERT profiles with interpretation.

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