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The Application of Geophysical Survey for Shallow Groundwater in Triassic weathered Meta-Sedimentary Aquifers at Sra Kaew College of Agriculture and Technology

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1. Introduction

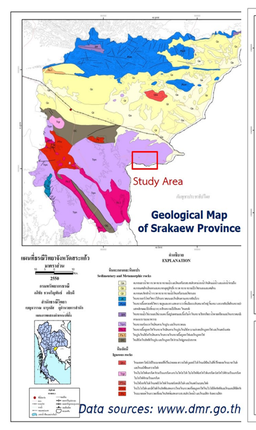
Sra Kaew College of Agriculture and Technology, Pan Suek Sub-district, Aranyaprathet District, Sra Kaew Province, is one of the colleges facing the problem of water shortage for agricultural and participated in the community-based water management project under the royal initiative of the Deputy Minister of Education, Dr. Kalaya Sophonpanich. There are two large reservoirs within the college, which have been excavated for many years. The depth of two reservoirs is about 3-5 meters.

The project has an idea to develop two reservoirs to increase the water storage capacity by digging to expand the depth of the reservoirs to have an increased depth from the original. In order to know the information on the depth and thickness of the soil - rock layer, before planning the excavation to expand the depth of the reservoir. Therefore, the survey of geophysical data is required first.

- Therefore, the project has been assigned the team to conduct a geophysical survey using the Vertical Electrical Sounding (VES) method, and then to process, analyze and interpret the data, to know the depth, thickness and type of soil-rock layers and shallow groundwater.
- Data from survey results to be used as information for planning and designing groundwater recharge wells, and determine the appropriate depth for digging groundwater recharge wells.
- This method helps to reduced the risk of the task/project before excavation of groundwater recharge to expand the depth of the reservoirs within the SCAT area.

2. Objectives and the background data of the study area

1. To apply geophysical survey for estimate the depth and thickness of the soil and rock layer and exploring shallow groundwater in weathered meta-sedimentary aquifers.
2. To supports the community-based water management projects under the Royal Initiative of the Deputy Minister of Education, Dr. Kalaya Sophonpanich, in the Sakaew College of Agriculture and Technology (SCAT).



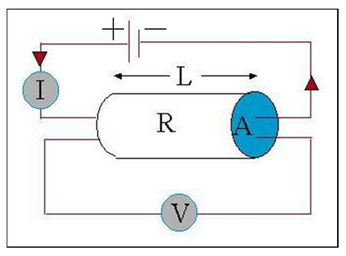
3. Methodology and Instrument

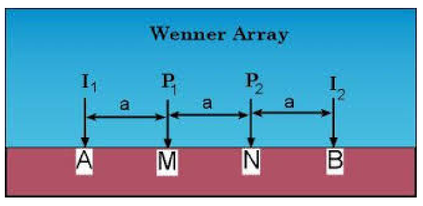
The survey principle

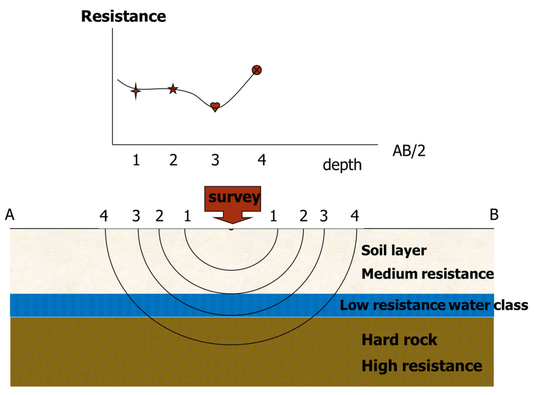
The survey principle is release the electricity into the underground, measure the electric current (I, ampare) and measure the electric potential (V, Voltage) and calculate the resistance by using the Ohm's formula

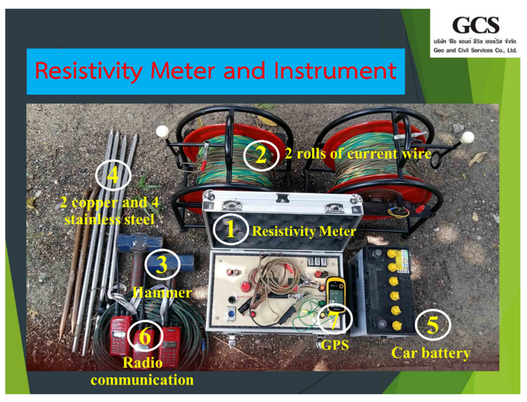
$$R = (k)\ V/I$$

Where k is the geometry, the constant value of the survey position when the voltage and current are measured.



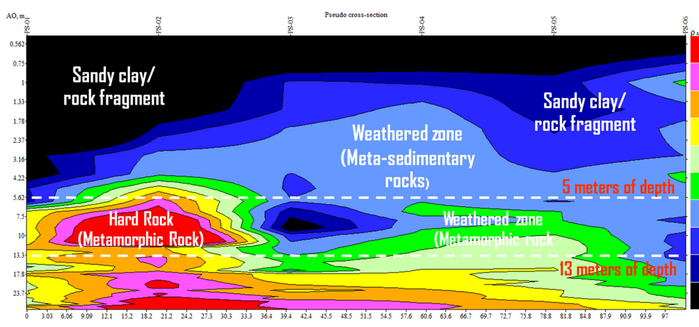




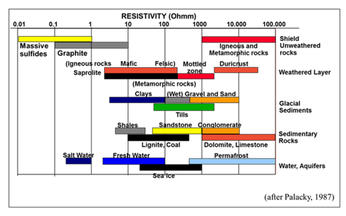


4. The study results

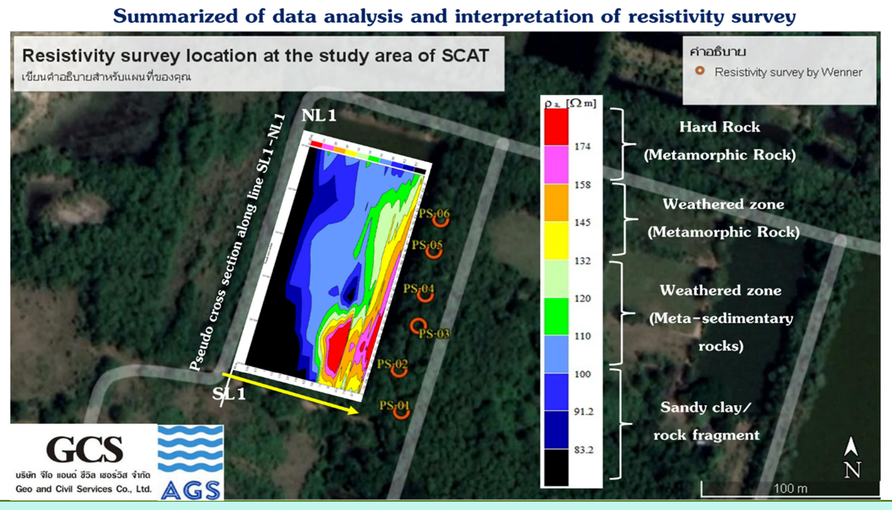
Pseudo geophysical cross section with soil–rock layer/shallow groundwater interpretation



The reference to the resistance range in different rock types



Summarized of data analysis and interpretation of resistivity survey

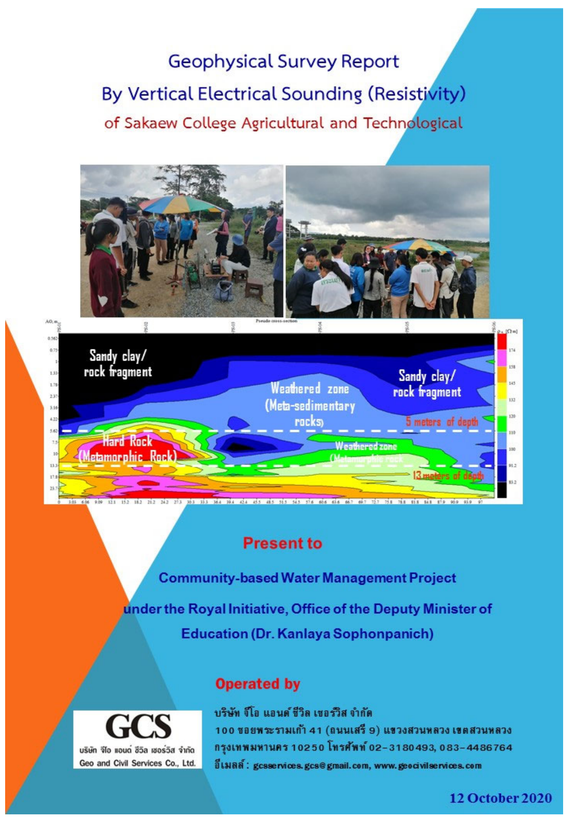


5. Summary

The results of the resistivity survey in the reservoir area at the Sra Kaew College of Agriculture and Technology, able to interpret and summarize as the resistance range, resistivity color scale, the depth range (meters) that found soil–rock and the classification of soil–rock layer and shallow groundwater as shown in the table.

Resistance range (Ohm-meter)	Color scale	Depth range (meters) that found soil-rock	Soil/rock layer/shallow groundwater
158 - 190	174 158 145 132 120 110 100 91.2 83.2	5 – 10 meters (some area) and 10 meters below (some area)	Hard rock (Metamorphic rock)
132 – 158		5 – 10 meters (some area) and 10 meters below (some area)	Weathered zone/Shallow groundwater (Metamorphic rock)
110 – 132		1-5 meters (some area) and 5-10 meters (some area)	Weathered zone (Meta-sedimentary rock)
70 – 110		0-1 meters (some area) and 1-5 meters (some area)	Sandy clay/ Rock fragment

5. Summary (cont.)



The resistivity survey results recommended to improve and develop the water source by digging the additional depth of the reservoir to the shallow aquifers that are weathered zones, i.e., *from the survey point No. PS–03 to PS–04, and the survey point No. PS–05 to PS–06 at 5–7 meters of depth, and develop the additional depth at the middle part of the reservoir for the depth of 7–11 meters.*

After submitting the survey report to the College of Agriculture and Technology. The project has expanded the depth of the reservoir according to the survey results.

6. Discussions and Suggestions

1) To develop the potential of water sources be able to apply knowledge of geology and application of geophysical to assist in planning, surveying, analyzing and water management effectively. In this regard, should be considered to the appropriateness of the survey methods selection according to the context of the study area.

2) The reservoir that improved and developed, Sra Kaew College of Agriculture and Technology should be effective water usage management to achieve a balance of water resources by calculated the amount of water recharge in the reservoir and the amount of water consumption for agricultural of SCAT.

6. Discussions and Suggestions (cont.)

3) The developed reservoir that excavation depth to the shallow aquifer. It is considered to be a natural recharge by rainwater during the rainy season. However, SCAT should be backup water management plan in case the water level in the college and surrounding areas is changing rapidly during in a severe water shortage crisis.

4) There should be a measure the changing of groundwater both quantity and water quality, such as measurement the water level in the reservoir and groundwater wells surrounding SCAT. Water quality monitoring by regularly collecting water samples for chemical analysis.