2-DIMENSIONAL GEORESISTIVITY SURVEY AT ANGADANAN, ISABELA

SMART WATER INFRASTRUCTURE AND MANAGEMENT R&D CENTER

PHYSIOGRAPHY

The municipality of Angadanan has a land area 20,400 hectares which constitutes about 1.56% of the total land area of Isabela. It comprises of 59 barangays and the terrain is relatively flat which is suitable for agriculture and infrastructure settlements. The center of the municipality is situated at approximately 16° 45' North, 121° 45' East, in the island of Luzon. The elevation at these coordinates is estimated at 62.7 meters or 205.5 feet above mean sea level (PhilAtlas).

LOCAL GEOLOGY

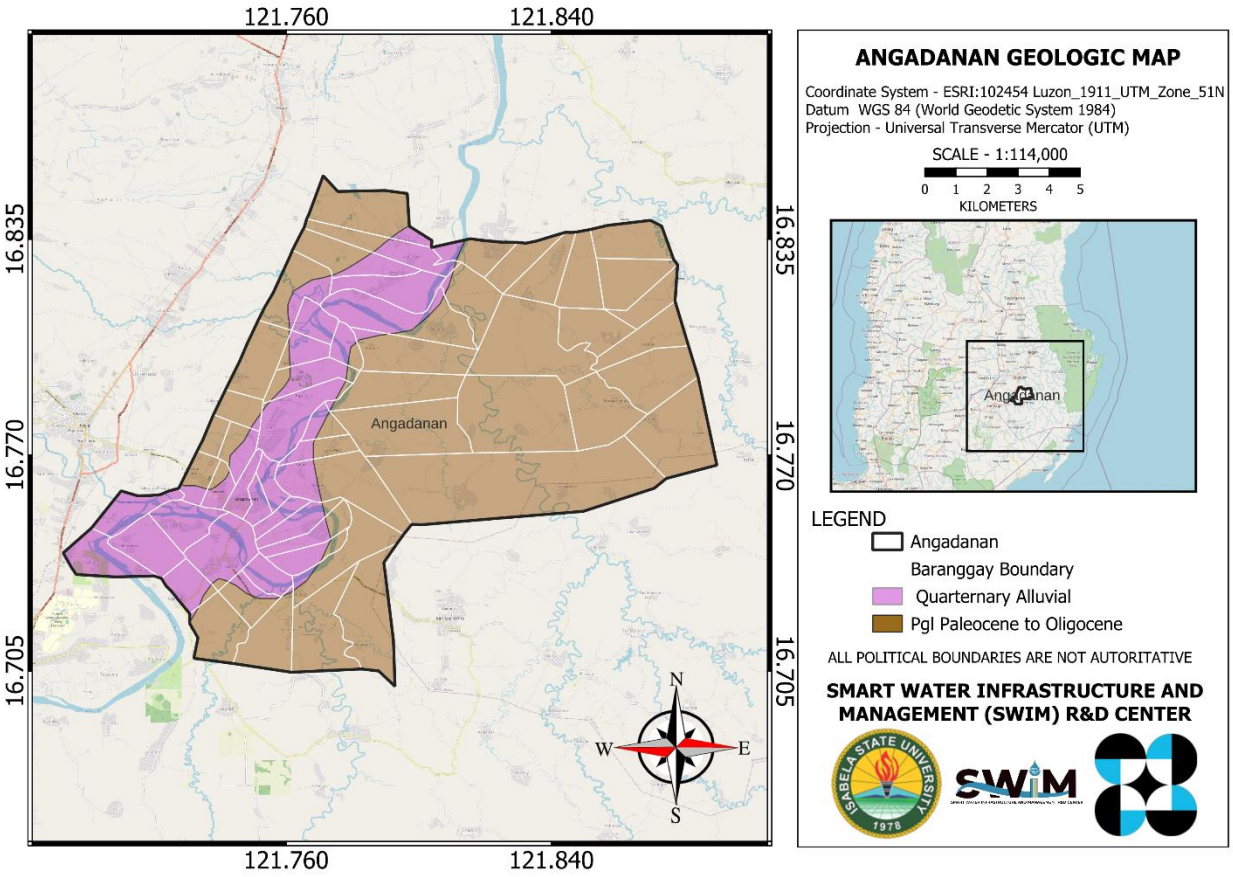


Figure 1. Geologic map of Angadanan, Isabela

The Geologic Map of Angadanan provides a clear depiction of the subsurface composition and geologic framework of the municipality. The area is predominantly underlain by Paleocene to Oligocene (Pgl) sedimentary formations, shown in brown, which are typically composed of consolidated rocks such as shale, sandstone, and siltstone. These older formations suggest a geologic history of marine or fluvial deposition, and they often serve as less permeable bedrock layers with limited groundwater storage capacity unless fractured. Superimposed on these older units are Quaternary Alluvial deposits, represented in pink, which follow the course of major river systems and stream channels. These deposits are composed of younger, unconsolidated sediments like sand, silt, and gravel, typically laid down by rivers. Due to their high porosity and permeability, these alluvial zones are highly significant for groundwater recharge and storage

GEOLOGICAL STRUCTURE

There are no perceptible geologic structures that could significantly affect the groundwater storage and flow. The only identifiable features and structures are found in the uppermost most of the soil and wells extending on the saturated zone or aquifer.

GEORESISTIVITY SURVEY

PRINCIPLES

Resistivity is a geophysical surveying technique that utilizes electrical measurements conducted on the ground surface to identify the depth and thickness of subsurface resistivity layers. In groundwater investigations, resistivity surveys help improve the understanding of underground formations and reduce the likelihood of drilling unsuccessful wells.

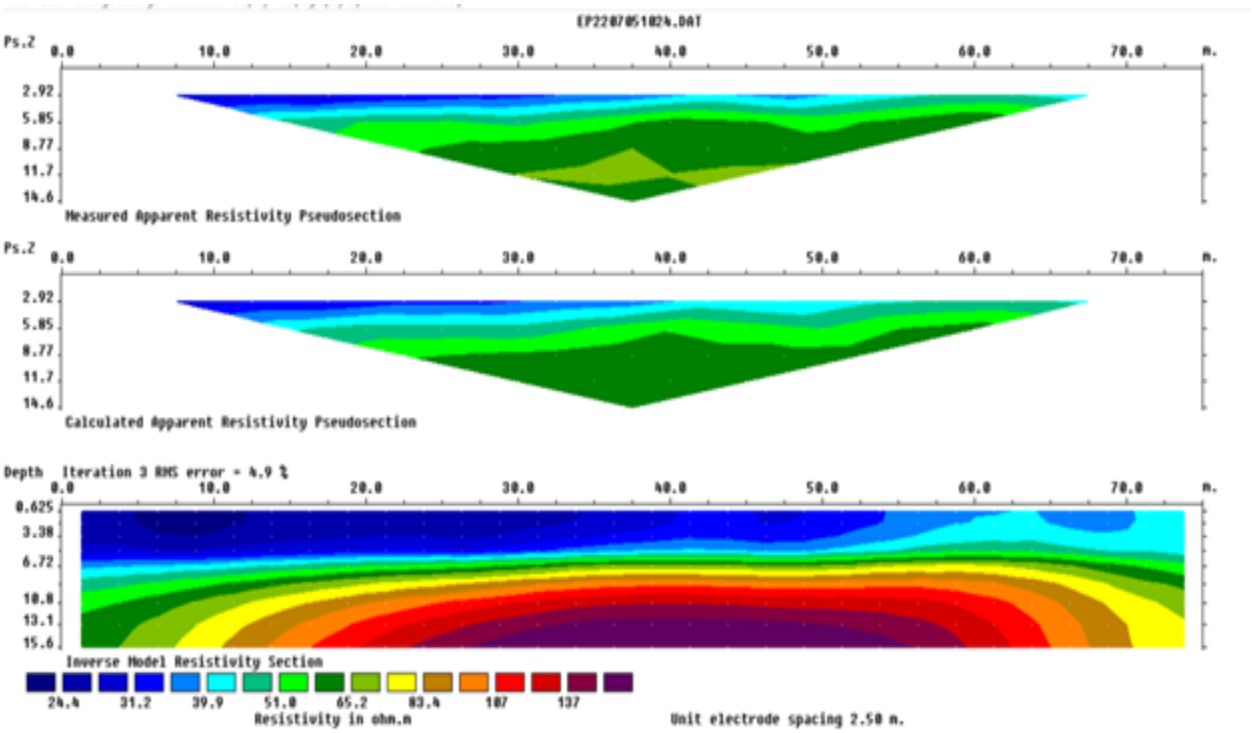
Since soil and rocks generally act as electrical insulators with high resistance, electrical currents primarily pass through moisture-filled pore spaces. The resistivity of these materials is influenced by factors such as porosity, permeability, the amount of pore water, and the concentration of dissolved solids. Various soil and rock types exhibit different resistivity values depending on their composition, texture, degree of fracturing or weathering, and groundwater content. This method involves injecting a known and often constant electrical current into the ground using two electrodes, called current electrodes. This process generates a potential field (voltage), which is then recorded through another pair of electrodes known as potential electrodes. The resistance obtained from these measurements is adjusted using a geometric factor to calculate the apparent resistivity.

Resistivity surveys can be conducted to analyze the sequence of resistivity layers beneath a specific location, a technique known as vertical electrical sounding (VES). The resistivity values obtained are then interpreted to determine the possible types of rock present below the surface.

RESULT

The figure below shows the result of the analyzed data of the 2D geo-resistivity survey at Angadanan, Isabela. This constitutes 3 section namely the measured Apparent Resistivity Pseudosection (top), the calculated Resistivity Pseudosection (middle), and the Inverse Model Resistivity Pseudosection (bottom). The measured Apparent Resistivity Pseudosection and calculated Resistivity section is close to each other with an RMS error of 4.9% meaning the data results is accurate and reliable.

The "Inverse Model Resistivity section reveals variations in subsurface resistivity values ranging from low represente by dark blue with values of 22 ohm.m to high as represented by red to dark brown, >150 ohm.m. Near the surface, 0–6 meters in depth, low to moderate resistivity values as depicted by blue to green hues dominate, likely representing saturated or clay-rich Quaternary Alluvial deposits, which are consistent with the geologic map showing widespread alluvial coverage in Angadanan. These zones are potential aquifers or groundwater-bearing formations. Below this, from around 6 to 15 meters depth, resistivity increases significantly, transitioning into yellow, red, and brown tones. These higher resistivity zones are indicative of more compact or dry sediments, sandy layers, or even weathered bedrock—possibly the underlying Paleocene to Oligocene formations (Pgl) noted in the geologic map.



CONCLUSION

Based on the result presented, near the surface, at depths of 0 to 6 meters yield low resistivity values indicating that in this layer. Therefore, this suggest that the water-bearing formations can be found at these depths, however, the result does not follow the usual pattern where the resistivity near at the surface is high. It is still suggested that the drilling depth should be more than 15 meters. Further hydrogeological verification such as test drilling or borehole logging is recommended to confirm the presence and quality of groundwater.