2-DIMENSIONAL GEORESISTIVITY SURVEY AT QUEZON, ISABELA

SMART WATER INFRASTRUCTURE AND MANAGEMENT R&D CENTER

PHYSIOGRAPHY

The municipality of Quezon has a land area of 268.26 km^2 or about 2.52% of the total land area of Isabela province. It comprises of 15 barangays, the central part has a relatively flat area and the northeast and eastern side with increasing slope and undulating topography.

LOCAL GEOLOGY

Municipality of Quezon consists of two primary geologic formations that influence its land use, terrain, and natural resources. The southwestern part of the municipality is dominated by Quaternary Alluvium which is composed of unconsolidated sediments like sand, silt, and clay. This type of formation is usually found in flat terrains and are suitable for agriculture and infrastructure settlements. In the central and northern parts of Quezon particularly in barangays like Simonte, Lepanto, and Allano, the surface geology transitions into older, more consolidated formations dating back to the Pleistocene epoch. These formations likely originated from uplifted marine environments and have been shaped by a long history of sedimentation and tectonic uplift.

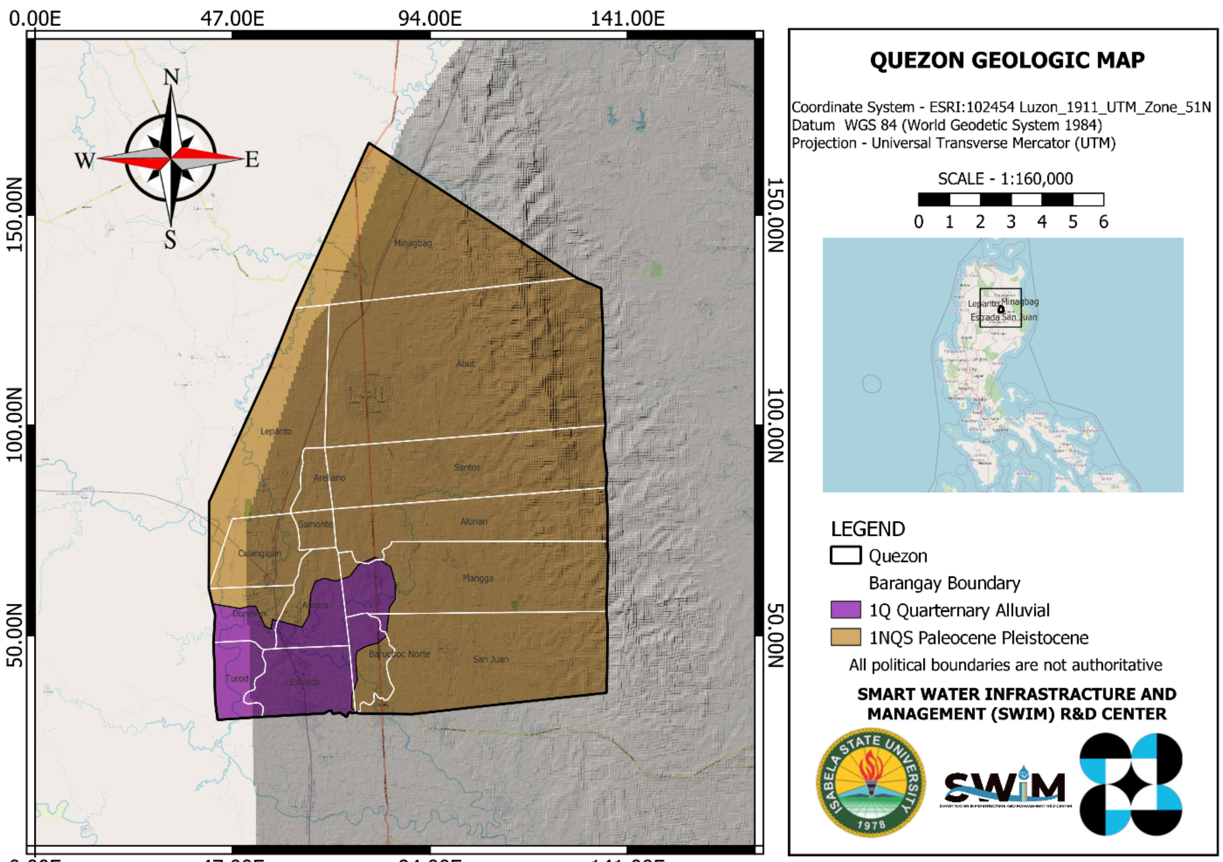


Figure 1. Quezon, Isabela Geologic Map

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.

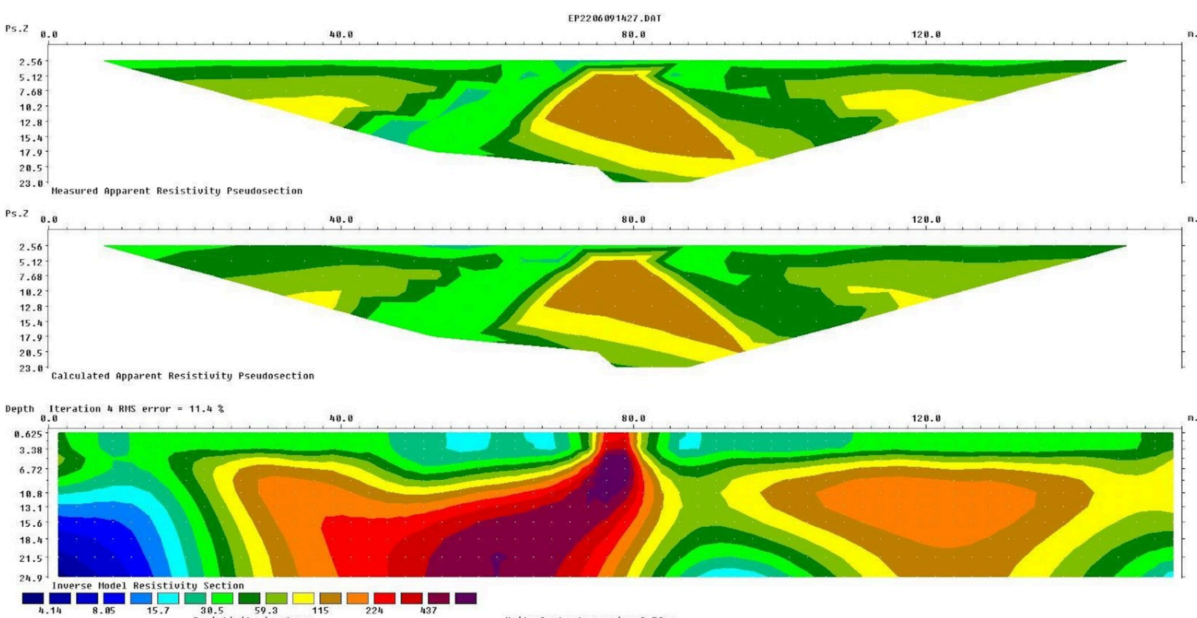
PRINCIPLES

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 2D geo-resistivity analysis presented above indicates notable fluctuations in the measured resistivity values over time. The figure illustrates that the measured Apparent Resistivity Pseudosection closely aligns with the calculated Apparent Resistivity Pseudosection which confirms the accuracy and reliability of the data. The Inverse Model Resistivity section provides the final interpretation of the data.A primary groundwater zone is identified at depths between 6.72m and 21.5m, where resistivity values remain low as represented by light colors of green and blue. The shades of blue representing a indicating the highest groundwater potential zone can be found at the depths of 18 to 25 meters. This suggests a water-bearing formation, likely composed of sand and weathered rock capable of holding and transmitting groundwater. The depths of 3.38m to 6.72m also exhibits moderate resistivity values (8.05 to 30.5 ohm-m) indicating a partially saturated layer, possibly a perched water table or a clay-rich formation that retains moisture but may not be a sustainable water source. The uppermost layers (0 to 6.72m) display higher resistivity, suggesting dry, compacted soil or rock, which is unlikely to yield significant water.

The RMS error of 11.4% suggests a moderate fit between the measured and calculated data, indicating that the inversion is reasonably reliable but may include some inconsistencies due to geological complexity or noise in data acquisition.

CONCLUSION

Based on the result, the optimal drilling depth for groundwater extraction should target the drilling depth of 18 meters to 25 meters where an aquifer is located. This area is suitable for further hydrological assessment or drilling. The high-resistivity zones, likely representing unsaturated or consolidated materials which are less favorable for groundwater extraction.