2-DIMENSIONAL GORESISTIVITY SURVEY AT REINA MERCEDES, ISABELA

SMART WATER INFRASTRUCTURE AND MANAGEMENT R&D CENTER

PHYSIOGRAPHY

The municipality of Reina Mercedes is located at approximately 6.9854, 121.8275, in the island of Luzon. Elevation at these coordinates is estimated at 50.0 meters or 164.0 feet above mean sea level. It has a land area of 5,714 hectares which constitutes about 0.44% of the total land area of Isabela. The topography is relatively flat which is suitable for agriculture and infrastructure settlement.

LOCAL GEOLOGY

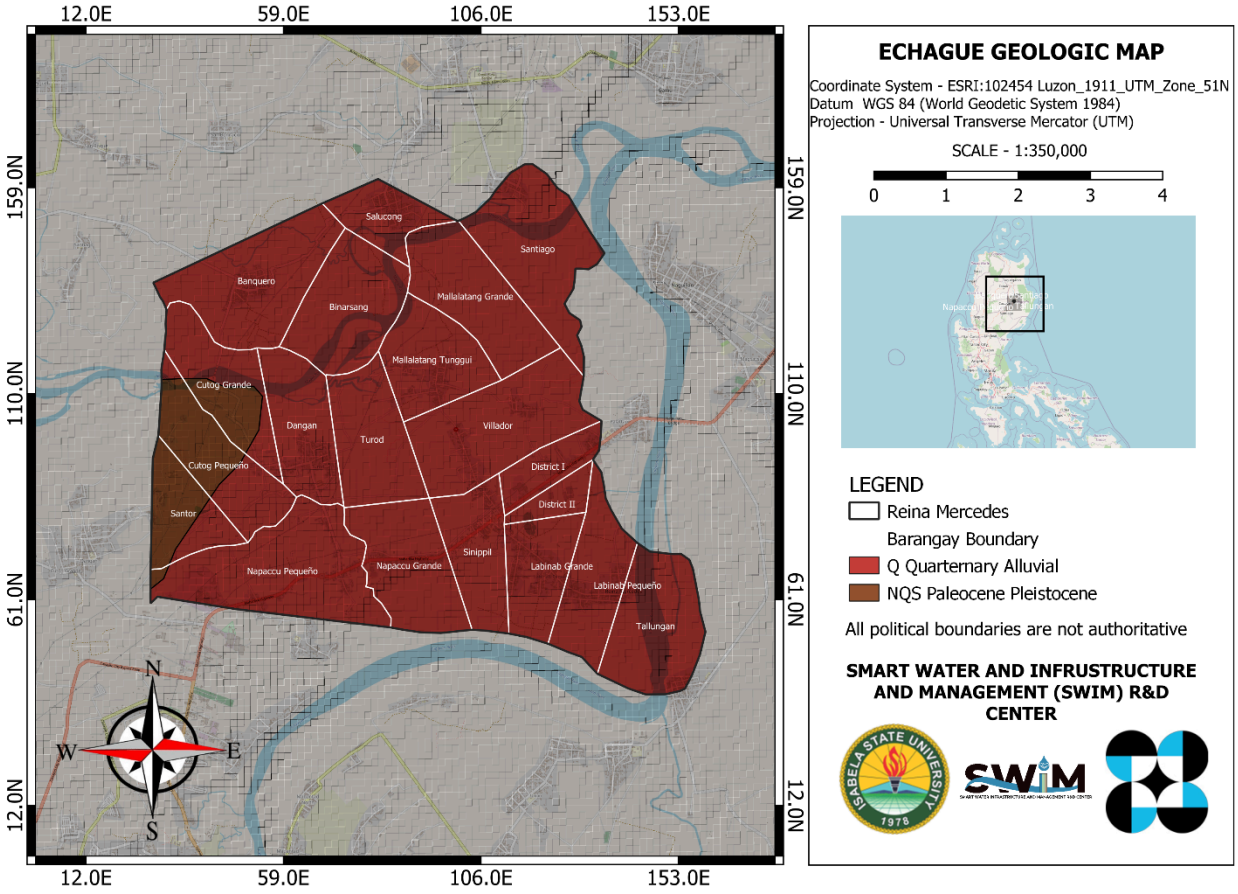


Figure 1. Geologic map of Reina Mercedes

The geologic map Reina Mercedes, Isabela, showcases the distribution of major geological formations within the municipality. The dominant geological unit in the area is the Quaternary Alluvial deposit, represented by the red shade that covers most of Reina Mercedes. These alluvial deposits typically consist of unconsolidated sediments such as sand, silt, clay, and gravel, which are commonly found in floodplains and river valleys—suggesting the area has been shaped significantly by fluvial processes over time. These materials are generally favorable for agriculture and groundwater storage, making them valuable in terms of land use and water resources.

A smaller portion of the municipality, particularly in the southwestern part covering barangays such as Cutog Grande and Santo, is underlain by the **NQS Paleocene to Pleistocene formations**, shown in brown. These older geologic units are likely more consolidated and may consist of sedimentary or volcanic rocks. Their presence indicates a more complex geologic history and less potential for water infiltration compared to the more porous alluvial deposits.

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.

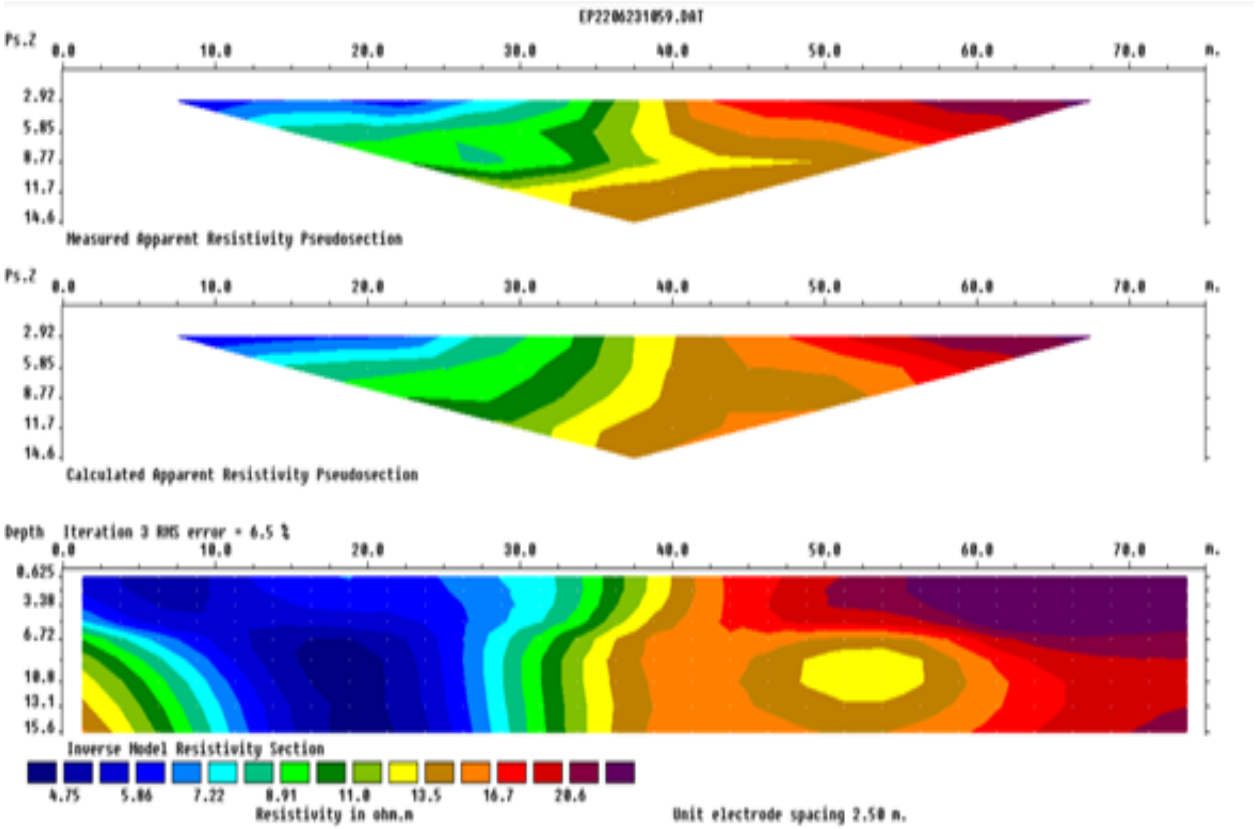
Resistivity surveys can be conducted to analyze the sequence of resistivity layers beneath a specific location, a technique known as vertical electrical sounding (VES). The resistivity values obtained are then interpreted to determine the possible types of rock present below the surface.

RESULT

The figure below shows the result of the analyzed data of the 2D geo-resistivity survey at San Mariano, 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 6.5% meaning the data results is accurate and reliable.

From the inverse model, resistivity values range from 4.75 to over 28 ohm·m, with noticeable variations in depth and horizontal extent. The left portion of the profile is dominated by low resistivity values represented by blue to green with values of 10 ohm·m near the surface, which typically indicate the presence of saturated clay, silty sediments, or water-bearing zones—favorable for groundwater accumulation. Toward the right side, there is a clear transition to higher resistivity zones represented by

orange to purple with values of >20 ohm·m at greater depths, which could represent a dry layer consolidated bedrock, dry gravel, or less permeable formations.



CONCLUSION

The 2D geo-resistivity result reveals a heterogeneous subsurface with distinct zones of low and high resistivity. The central and left sections suggest potential aquifer zones due to low resistivity, whereas the right portion, with higher resistivity, likely indicates bedrock or less saturated formations. In terms of drilling depth, it is recommended that the depth of groundwater extraction is greater than 15 meters for sustainability of the well.