



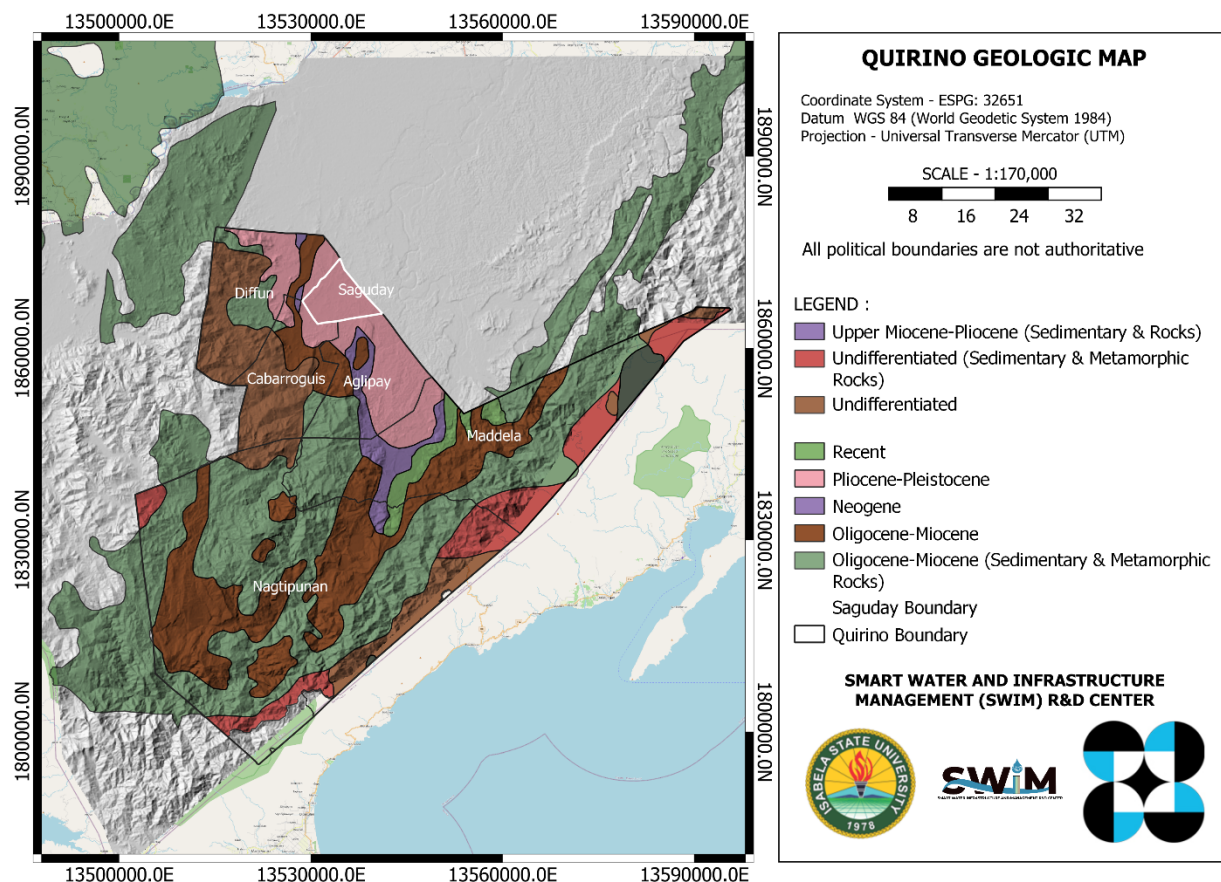
SMART WATER INFRASTRUCTURE AND MANAGEMENT R&D CENTER

2-DIMENSIONAL GEORESISTIVITY SURVEY AT SAGUDAY, QUIRINO

PHYSIOGRAPHY

The municipality of Saguday, Quirino has a land area of 51.69 km² which constitutes about 2.23% of the total land area of Quirino province (PhilAtlas). It is located at the northwestern portion of the province where its terrain is relatively flat to moderately dissected. It is likely suitable for settlements and agriculture unlike Nagtipunan and Maddela which exhibit rugged topography.

LOCAL GEOLOGY



The local geology of Saguday, Quirino is predominantly underlain by Undifferentiated (Sedimentary & Metamorphic Rocks) which represented by a pink shade. The presence of both sedimentary and metamorphic rocks common lithologies that may be present include sandstone, shale, phyllite, and schist, which are known to exhibit varying degrees of permeability and weathering characteristics. From a groundwater perspective, this geologic setting implies a

moderate to low aquifer potential. Sedimentary layers such as sandstone may serve as moderately productive aquifers where they remain uncemented and well-jointed, allowing groundwater to flow through pore spaces or fractures. Wells drilled in these areas might show inconsistent yields, and sustainable groundwater extraction would require careful site-specific investigation.

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.

SURVEY DETAILS

Location of site: Saguday, Quirino

There are approximately 3 kilometers between the Echo Tourism Park and the Municipal Hall of Saguday. The team conducted a geo-resistivity survey using McOHM Profiler 8i with the Wenner Array function. Measurement lines 160 m long were used, along with electrodes spaced 5 m apart. After gathering data through measurement and calculation, the non-linear least-squares optimization approach is used to perform a 2-dimensional inversion. The team extracted the subsurface resistivity distribution, which is shown in different colors, from the outcomes of the 2D inversion.



Figure 1. Overview map of Echo Tourism Park and the photos taken during the survey

RESULT

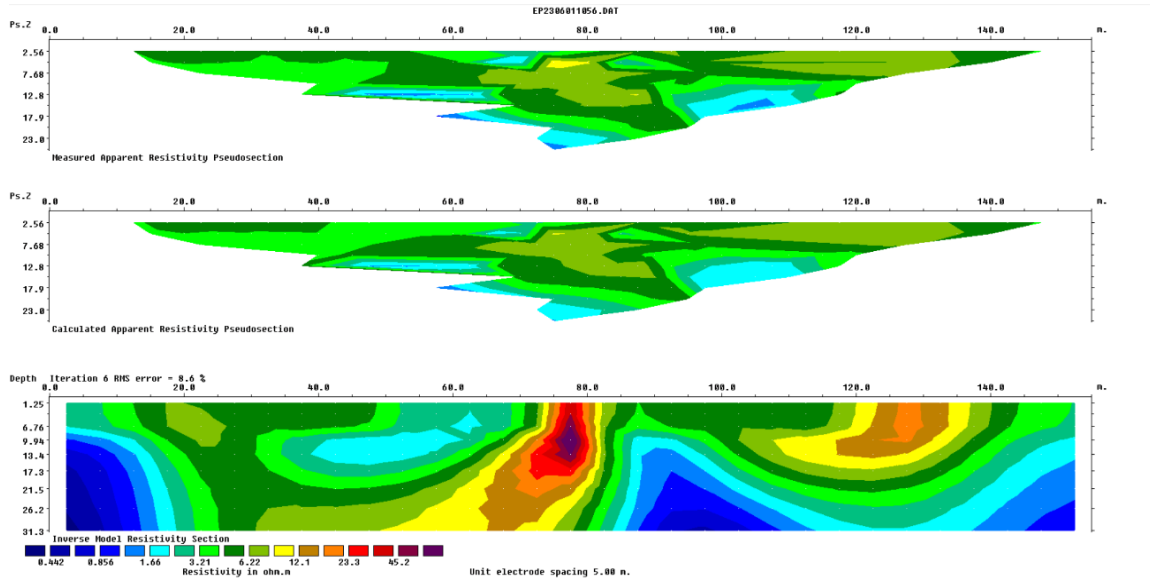


Figure 2. 2-Dimensional geo-resistivity survey result.

The 2D geo-resistivity survey result portrays the readings of depth relative to resistivity values, it shows that there is a uniform distribution of measured resistivity value along the horizontal profile. As shown in the figure above, the measured Apparent Resistivity Pseudosection and the calculated Apparent Resistivity Pseudosection is relatively close making sure that the data is accurate and reliable. It is supported by the RMS error of 8.6% within acceptable limits for geoelectrical inversion, suggesting the result is reliable.

In the Inverse Model Section, high resistivity zones are depicted in orange and red with values greater than 23.3 ohms found in the middle of the profile extending up to 17 meters. This zone may compose of compacted sediments and rocks with minimal water retention. Meanwhile, the low resistivity regions are represented of green to suggesting the presence of saturated clays, silts, or possibly water-bearing formations. Water is found at depths 6 meters and above, the layer could be a perched water table.

CONCLUSION

The 2D geo-resistivity survey effectively identifies the different resistivity variations and locate the potential groundwater-bearing formations. Based on the results, the optimal drilling depth for groundwater extraction should target at least 20m, where the deep aquifer is located. The uppermost layers from the surface to 6 meters deep, exhibits low resistivity indicating wet or

porous materials. the layer could be a perched water table. Additional surveys, such as vertical electrical sounding (VES) or borehole logging, could help confirm the thickness and quality of the groundwater source. This analysis provides important insights for water resource management, guiding well placement and ensuring sustainable groundwater extraction.

REFERENCES

“Echague, Isabela Profile – PhilAtlas.” *Www.philatlas.com*,
www.philatlas.com/luzon/r02/isabela/echague.html.