OPEN ACCESS Freely available online

Journal of Geology & Geophysics

Perspective

Borehole Lithology and Electrical Resistivity of Geotechnical Sites

Jianjun Ge*

Department of Geography, Oklahoma State University, Oklahoma, USA

DESCRIPTION

Geotechnical site investigation is an essential part of any construction project, providing crucial information about the physical properties of the subsurface. One of the most common methods used in geotechnical site investigation is borehole drilling, which involves extracting soil and rock samples from the subsurface. Electrical resistivity is another commonly used geophysical technique that can provide information about the subsurface.

Borehole lithology

Borehole lithology refers to the study of the composition and characteristics of subsurface materials encountered during the drilling of boreholes. Borehole lithology is a crucial aspect of geotechnical site investigation, providing information about the physical and mechanical properties of the subsurface materials, such as strength, permeability, and compressibility. The information obtained from borehole lithology is used to develop a geological model of the site, which is then used to design the foundations, excavations, and other structures.

Borehole lithology is typically determined by visual inspection of the extracted soil and rock samples. The samples are logged and described using standard classifications, such as the Unified Soil Classification System (USCS) for soils and the Rock Mass Rating (RMR) system for rocks. The classification of the samples is based on several factors, including grain size, mineral composition, and degree of weathering.

Electrical resistivity

Electrical resistivity is a geophysical technique used to measure the electrical properties of the subsurface materials. Electrical resistivity is based on the principle that different materials have different electrical resistivities, or the ability to resist the flow of electrical current. The electrical resistivity of the subsurface materials is measured by passing an electrical current through the ground and measuring the resulting voltage.

The electrical resistivity of subsurface materials can be affected by several factors, including moisture content, mineral composition, and porosity. Moist materials, such as clay, have high electrical resistivities, while dry materials, such as sand, have low electrical resistivities. The electrical resistivity of subsurface materials can also be affected by the presence of conductive minerals, such as pyrite, which can increase the electrical conductivity of the subsurface materials.

Interrelationship between borehole lithology and electrical resistivity

The interrelationship between borehole lithology and electrical resistivity is based on the fact that the electrical resistivity of subsurface materials is affected by the same factors that determine borehole lithology. For example, materials with high moisture content, such as clay, have high electrical resistivities and are typically classified as fine-grained soils. Conversely, materials with low moisture content, such as sand, have low electrical resistivities and are typically classified as coarse-grained soils.

The relationship between borehole lithology and electrical resistivity can also be used to predict the lithology of the subsurface materials between boreholes. For example, if a borehole encounters a layer of sand with a low electrical resistivity, it is likely that a layer of sand with a similar lithology exists between the boreholes. This information can be used to develop a more accurate geological model of the site, improving the design of structures and foundations.

The relationship between borehole lithology and electrical resistivity can also be used to estimate the porosity and permeability of the subsurface materials. The porosity and permeability of subsurface materials are critical factors in determining the flow of groundwater, which can affect the stability of structures and the performance of foundations. Electrical resistivity measurements can provide information about the porosity and permeability of the subsurface materials, which can be used to estimate the hydraulic conductivity and thepotential for groundwater flow.

The interrelationship between borehole lithology and electrical resistivity has several applications in geotechnical site investigation. One of the most common applications is the design

Correspondence to: Jianjun Ge, Department of Geography, Oklahoma State University, Oklahoma, USA, E-mail: geoge.jianjun@gmail.com

Received: 07-Apr-2023; Manuscript No. JGG-23-24254; **Editor assigned:** 10-Apr-2023; PreQC. No. JGG-23-24254 (PQ); **Reviewed:** 24-Apr-2023; QC. No. JGG-23-24254; **Revised:** 02-May-2023; Manuscript No. JGG-23-24254 (R); **Published:** 09-May-2023, DOI: 10.35248/2381-8719.23.12.1100.

Citation: Ge J (2023) Borehole Lithology and Electrical Resistivity of Geotechnical Sites. J Geol Geophys. 12:1100.

of foundations for structures. The stability and performance of foundations are dependent on the physical and mechanical properties of the subsurface materials, which can be determined using borehole lithology and electrical resistivity measurements. The interrelationship between these two techniques can provide valuable information for the design of foundations, including the type of foundation, depth, and size.

Another application of the interrelationship between borehole lithology and electrical resistivity is the identification of potential geological hazards, such as landslides and sinkholes. The geological hazards are often associated with specific lithological units that have high permeability and low shear strength. Electrical resistivity measurements can provide information about the porosity and permeability of subsurface materials, which can be used to identify the lithological units that are prone to geological hazards.

The interrelationship between borehole lithology and electrical resistivity is a crucial aspect of geotechnical site investigation. The combination of these two techniques provides valuable information about the physical and mechanical properties of subsurface materials, including strength, permeability, and compressibility. The interrelationship between borehole lithology and electrical resistivity can also be used to develop more accurate geological models of the site, improving the design of structures and foundations. The applications of the interrelationship between borehole lithology and electrical resistivity are numerous and can be used to identify potential geological hazards and design safer and more stable structures. Overall, the interrelationship between borehole lithology and electrical resistivity is an essential tool for geotechnical engineers, providing critical information for the safe and effective design and construction of structures and foundations.