

## 6.4 VOLCANIC MASSIVE SULFIDE (VMS) ORE DEPOSIT IN WESTERN SAUDI ARABIA: A GEOPHYSICAL STUDY

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### ABSTRACT

In the past ten years, significant progress has been made in developing geophysical technologies specifically designed for mining exploration directly relevant to Volcanogenic Massive Sulfide (VMS) exploration. The utilization of different geophysical methods, such as seismic, DC, EM, gravity, and magnetic, has proven to have a significant practical value in the exploration of VMS deposits. This paper briefly describes the application of gravity, magnetic, and Transient ElectroMagnetic over the Hawiah VMS deposit in Saudi Arabia. The Hawiah deposit has been well constrained through drilling and more standard geophysical methods, allowing the study to validate the various geophysical methods against a known structure and, after that, investigate the subsurface geological uncertainty in specific areas of the site away from known mineralization and to evaluate the ore characteristics and geophysical response and compare back to the constrained areas. The resulting geophysical images were confirmed by seismic and geoelectrical surveys. The geophysical images helped improve the preliminary conceptual model developed using the borehole data and other geophysical information. This research aims to enhance exploration planning, efficiency, and sustainability by reducing costs and saving time.

**KEYWORDS:** Mining geophysics, VMS, Saudi Arabia