



## GEOPHYSICAL INVESTIGATIONS FOR DELINEATION OF DISTRESSED ZONES AT KALWANDE DAM, MAHARASHTRA



### STUDY OVERVIEW

Kalwande Dam was constructed on Local Nallah of West flowing rivers from Tapi to Tadri at Kalwande village, near Chiplun, Ratnagiri district. It is an earthen dam whose construction commenced in the year of 1974 with a catchment area of 3.42 Sq.Km for drinking and irrigation purpose. Seepage/Leakage to the dam is a serious concern ever since it started storing water in the reservoir. During the years, the cracks in the wall became more pronounced to huge loss of water due to heavy showers during the monsoon and the reservoir filled to be brim raising apprehensions about the safety of the dam, loss of storage water leading to reduce effectiveness of purpose of dam and very distressful vie of the dam. In this regard, project authority requested to conduct Electrical Resistivity Imaging studies to map the cracks/cavities and delineate distressed zone (if any) to take remedial measures for controlling seepage through dam body.

### APPROACH

The Electrical Resistivity Imaging survey has been conducted along four profiles. Profile P1 and P2 were conducted on the dam axis throughout the length of the dam. Whereas, Profile P3 & P4 were conducted in the downstream berm. Electrodes spacing of 1.5 m and 2 m with 72 electrode system were used to achieve profile length of 106.5 m and 142 m respectively. Overlapping profiles are taken for better resolution and coverage. All the profiles are oriented in E-W direction Different types of electrode array combination have been used for achieving better resolution and depth of investigation.

### KEYFINDINGS

Four ERI profile results represents very low resistivity of  $< 60 \Omega\text{-m}$  indicates highly saturated soils which are susceptible for seepage through dam body. A moderate resistive layer (60 to  $250 \Omega\text{-m}$ ) of varying thickness was observed though out the profile indicates the presence of Weathered/fractured basalt saturated (distressed zone) in the foundation rock. Layer with resistivity  $> 250 \Omega\text{-m}$  was considered as hard compact basalt/ bed rock

ERI studies on the dam axis and the berm, the result signifies the very low resistivity values of  $< 60 \Omega\text{-m}$  were very prominent in the dam body. Moreover, the foundation strata observed below the dam body is highly weathered/fractured basalt which is also more prone to seepage. Low resistivity zones observed in the dam body should be verified by borehole logging if required and should be treated with suitable grout material. On the other hand, the foundation strata is also needs to be treated with suitable grout material as it is observed to be highly weathered/fractured by ERI study and validated with borehole litho logs.

### IMPACT

The study results will give the information on distressed zones which are prone to seepage through dam body. Based on the study results project authority can take the remedial measures with suitable grout material to arrest the seepage. The dam authority can serve the purpose of dam by providing water for drinking and irrigation needs.

### Schematic view of 3-D diagram of data acquisition by ERI

