

Chapter 12 Subsurface investigations of GW

Detailed and comprehensive study of GW and conditions – by subsurface investigation

Information needed

Aquifer : its location, thickness, composition, permeability and yield

Groundwater :its location, movement and quality

12.1 Test Drilling

Small diameter holes to ascertain geologic and groundwater conditions prior to well drilling

Method : cable tool (for unconsolidated formation, costly), hydraulic rotary (quicker)

A geologic log from well cuttings (Fig 12.1.1)

Good to keep sample of well cuttings systematically

Drilling time log (Fig 12.1.3)

12.2 Water level measurement

Electric water-level sounder

Air-line method

Rock technique (Table 12.2.1)

12.3 Geophysical logging

Lowering sensing devices in a borehole and recording a physical parameter

Table 12.3.1 (techniques and information gained)

12.4 Resistivity logging

Within an uncased well, current and potential electrode can be lowered to measure electric resistivities of the surrounding media and to obtain a trace of their variation with depth--- resistivity log

See Fig 12.4.1 and 12.4.2

Temperature correction/salinity

12.5 Spontaneous Potential Logging

Measurement of natural electrical potentials found within the earth.

One electrode is lowered in an uncased well and the other is connected to the ground surface.

Potential values range from zero to several hundred millivolts.

See Fig 12.4.2

12.6 Radiation logging

Measurement of fundamental particles emitted from unstable radioactive isotopes.

Natural gamma logging

Gamma-gamma logging

Neutron logging

Fig 12.6.2

12.7 Temperature logging

Normally 3 degree celcius for each 100 m in depth

Departures from this normal gradient may provide information on circulation or geologic conditions.

12.8 Caliper logging

Designed with arms hinged at the upper end and pressed against the hole wall by springs.

To identify the lithology and stratigraphic correlation in the location of fractures another rock openings.

Fig 12.8.1

12.9 Fluid Conductivity logging

12.10 Fluid velocity logging

12.11 miscellaneous logging techniques

(television, acoustic, casing)

12.12 other subsurface methods