

### 3-4-3 Geophysical survey

At the 5 sites selected by the interpretation of satellite images and aero-photographs and preliminary exploration, electric soundings were carried out in addition to field exploration to determine the geological structure.

At some sites in Tangapore Village and Nare Village, magnetic soundings were also carried out, whose results only confirmed those of the electric soundings but with less precision. The electric soundings are thus more useful for detecting underground structure at a shallow depth.

#### (1) Method of electric soundings

The electric soundings were carried out using the vertical quadripole method (Wenner's method). From their results, resistivity profiles were drawn to analyze the underground structure. One of the resistivity profiles thus obtained is shown in Fig. 3.7.

For the electric soundings and the analysis of their results, the following points were taken into account.

- 1) Survey lines for the resistivity profiles, whose length was about 150 to 500 m, were set across the assumed underground structure. Along the survey lines, the electric soundings were carried out with an interval of about 50 to 100 m, namely 3 to 10 survey points per line.
- 2) At each survey point, a sounding line was drawn parallel to the direction of the supposed underground structure.
- 3) To obtain a three-dimensional view of the geological structure, 2 to 3 survey lines for the resistivity profiles were set as far as possible.
- 4) The resistivity of the basement rock (lateritic crust, heavily weathered rock, and fresh rock) were determined by lengthening the survey lines to an outcrop of basement rock or to a point where basement rock was definitely present at a very shallow depth. These resistivities determined largely contributed to the geological interpretation of the resistivity profiles.
- 5) Where there were wells (in particular "dug wells") allowing observation of the groundwater level and geological sections, electric soundings were also carried out near the wells to determine the resistivity of the well site. These resistivities increase the certainty of the geological interpretation of the resistivity profiles.

Resistivity determined by electric soundings reflects not only the electrical properties of the rock and soil, but also those of the groundwater. Even in the strata composed of identical materials, resistivity may vary remarkably if there is a large difference in their water content. Therefore, resistivity is not sufficient for precisely determining the lithological nature of the strata. However, resistivities and resistivity profiles obtained from electric soundings carried out at a large number of points are important clues in estimating the geological structure and the state of groundwater because zones of almost identical resistivity can be considered to correspond to strata with identical lithologies and water content.

(2) Selection of the subsurface dam sites based on the electric soundings

The results of the examination of the geological structure of each of the 5 sites on the basis of the field exploration and the electric soundings were as follows:

a. Saouga (south of Gorom Gorom, Oudalan Province)

This site probably had a fossil valley that was an aquifer of shallow groundwater. However, the construction of the subsurface dam would be too large as a demonstration study.

b. Nare (south of Tougouri, Namentenga Province)

This site probably had a fossil valley that was an aquifer of shallow groundwater. Although constructing a subsurface dam here would be a little too large as a demonstration study, the site was suitable for a subsurface dam.

c. Louda (south of Kaya, Sanmatenga Province)

A ring-shaped landform had been formed at this site, but no favorable aquifer was discovered.

d. Bassneil (north of Korsimoro, Sanmatenga Province)

A ring-shaped landform had been formed at this site, but an unconsolidated sediment layer that could have been an aquifer was likely to be very thin.

e. Tangapore/Kossoden (north of Korsimoro, Sanmatenga Province)

This site was of a bottleneck-shaped landform located downstream of a ring-shaped landform, and the presence of shallow groundwater was suggested by the results of the survey of existing wells. The resistivity profiles by electric soundings also indicated the possible presence of a fossil valley whose size was appropriate for a demonstration study. This site was thus probably suitable for a subsurface dam site.

As a result of the survey described above, 2 sites were selected as candidates for the subsurface dam site: Tangapore Village, Korsimoro District, Sanmatenga Province, and Nare Village, Tougouri District, Namentenga Province.

The number of electric soundings carried out at these 2 sites were as follows:

- at Tangapore: 58 points on 4 survey lines
- at Nare: 95 points on 6 survey lines

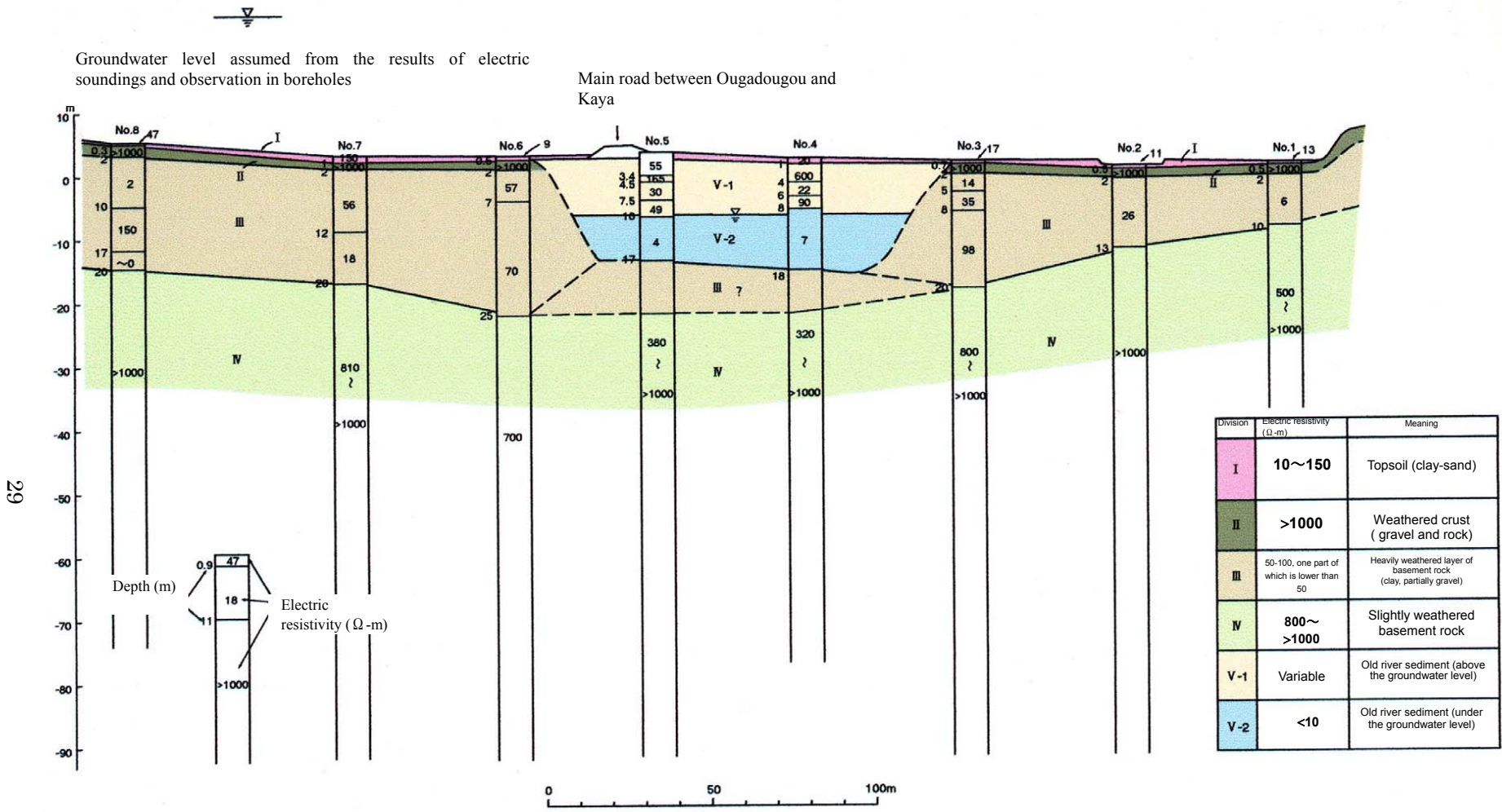


Fig. 3.7-1: Resistivity profile at the north of Korsimoro - point C (Tangapore)

Fig. 3.7: Resistivity profiles based on the electric soundings

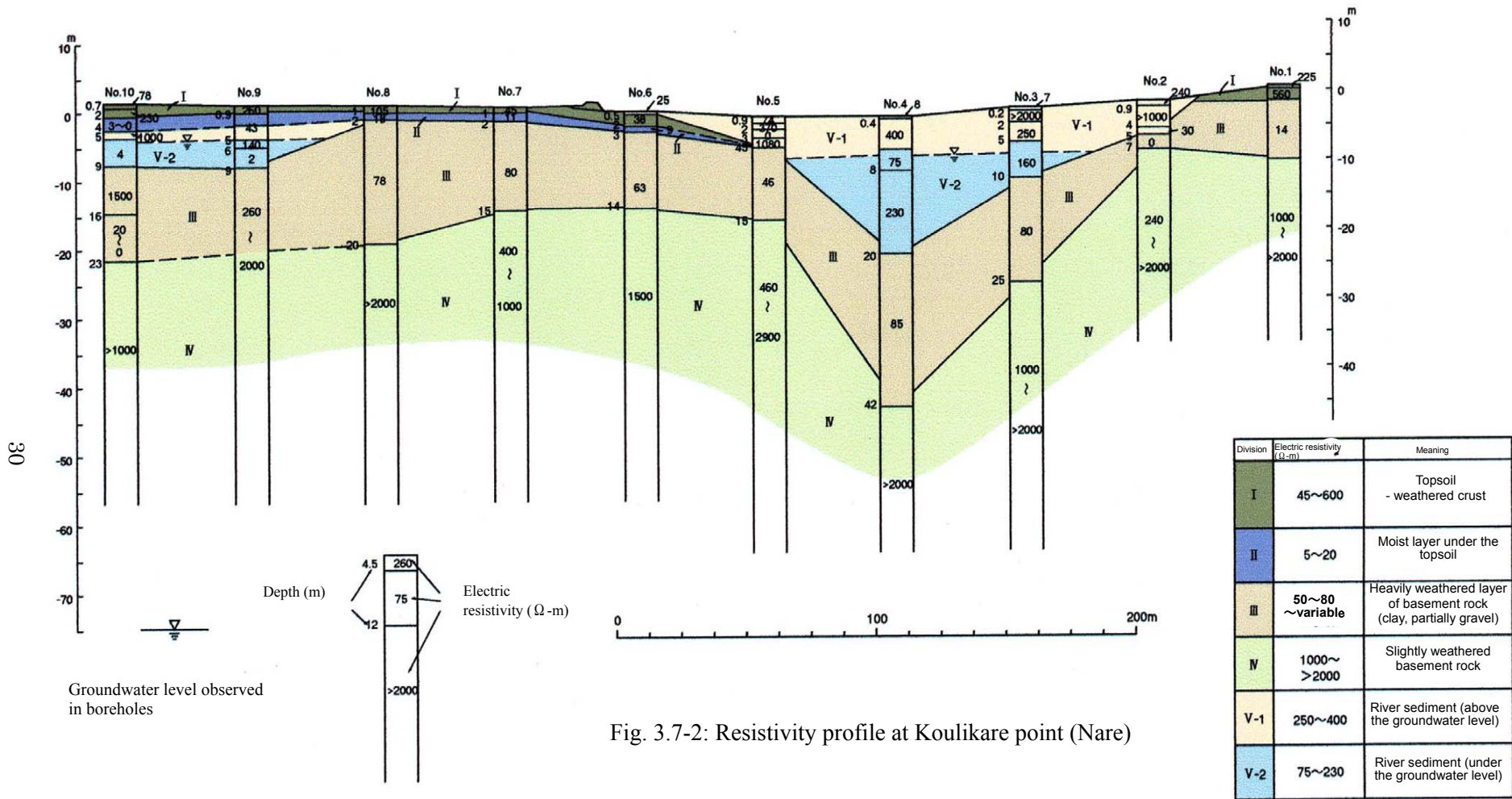


Fig. 3.7-2: Resistivity profile at Koulikare point (Nare)