

In this project at Nare, the "earth dam" method shown at the bottom of Table 4.1 was adopted for the following reasons:

- 1) The "fossil valley" was buried deep (about 8 m below the ground surface), and it had almost no groundwater run-off in the dry season. It was thus possible to apply this method.
- 2) This method does not require sophisticated machines and could be carried out with those available in Burkina Faso.
- 3) The cost of construction, including transportation and rental of machines, was the lowest.

#### **4-2 Characteristics of the subsurface dam built at Nare**

The characteristics of the subsurface dam built at Nare for this model project are as follows:

##### **(1) Site**

In the fossil valley in the Koulikare Quarter, Nare Village, Tougouri District, Namentenga Province, Burkina Faso

##### **(2) Structure of the dam body**

"Subsurface earth dam" (see Fig. 4.1)

- Depth of the base: 3.0 m to 11.4 m below the ground surface (maximum height of the dam: 8.4 m)
- Crest length: 216.3 m
- Width (thickness): 8.6 m at the base, 3.0 m at the crest
- Volume: 7,144 m<sup>3</sup>
- Filling materials: clayey silt (heavily weathered layer of basement rock)
- Permeability coefficient: 10<sup>-7</sup> to 10<sup>-8</sup> cm/sec (very partly, 10<sup>-6</sup> cm/sec)

At the upstream side of the base of the dam, an "anchor key" with about a 3- to 4-m width and a 1.5-m depth (protrusion into the basement rock) was formed to protect the base. At a level just above the crest, about a 1-m-thick layer of gravel with a similar diameter was laid to ensure good permeability.

##### **(3) Water source of the subsurface dam reservoir**

Shallow groundwater within the fossil valley buried along the Kolongo River, a tributary of the Gouaya River that is a part of the Niger River basin

##### **(4) Dimensions of reservoir**

- Maximum extent of reservoir area: 13.4-km length, about 150-m average length (lowest estimate), about 2-km<sup>2</sup> area
- Volume of reservoir layer: About 9,000,000 m<sup>3</sup> (estimate)
- Water storage capacity: About 1,800,000 m<sup>3</sup> (estimate)

##### **(5) Amount of construction work**

- Excavation: Excavation of soil: 51,213 m<sup>3</sup>, excavation of rock: 4,377 m<sup>3</sup>, total: 55,590 m<sup>3</sup>
- High-density filling (the dam body): 7,144 m<sup>3</sup>

- Medium-density filling (upstream and downstream sides of the dam): 26,662 m<sup>3</sup>
- Low-density filling (above the dam): 21,814 m<sup>3</sup>

(6) Used machines

- Bulldozers: 2 to 3 units
- Backhoes: 1 to 2 units (excavators)
- Trucks: 2 to 3 units (dump trucks)
- Rollers: 1 to 2 units (Komatsu JV100)

(7) Duration of construction

From 15 November 1997 to the end of June 1998. This period included the construction of other experimental facilities, and the actual duration devoted to the construction of the subsurface dam was about 4.5 months.

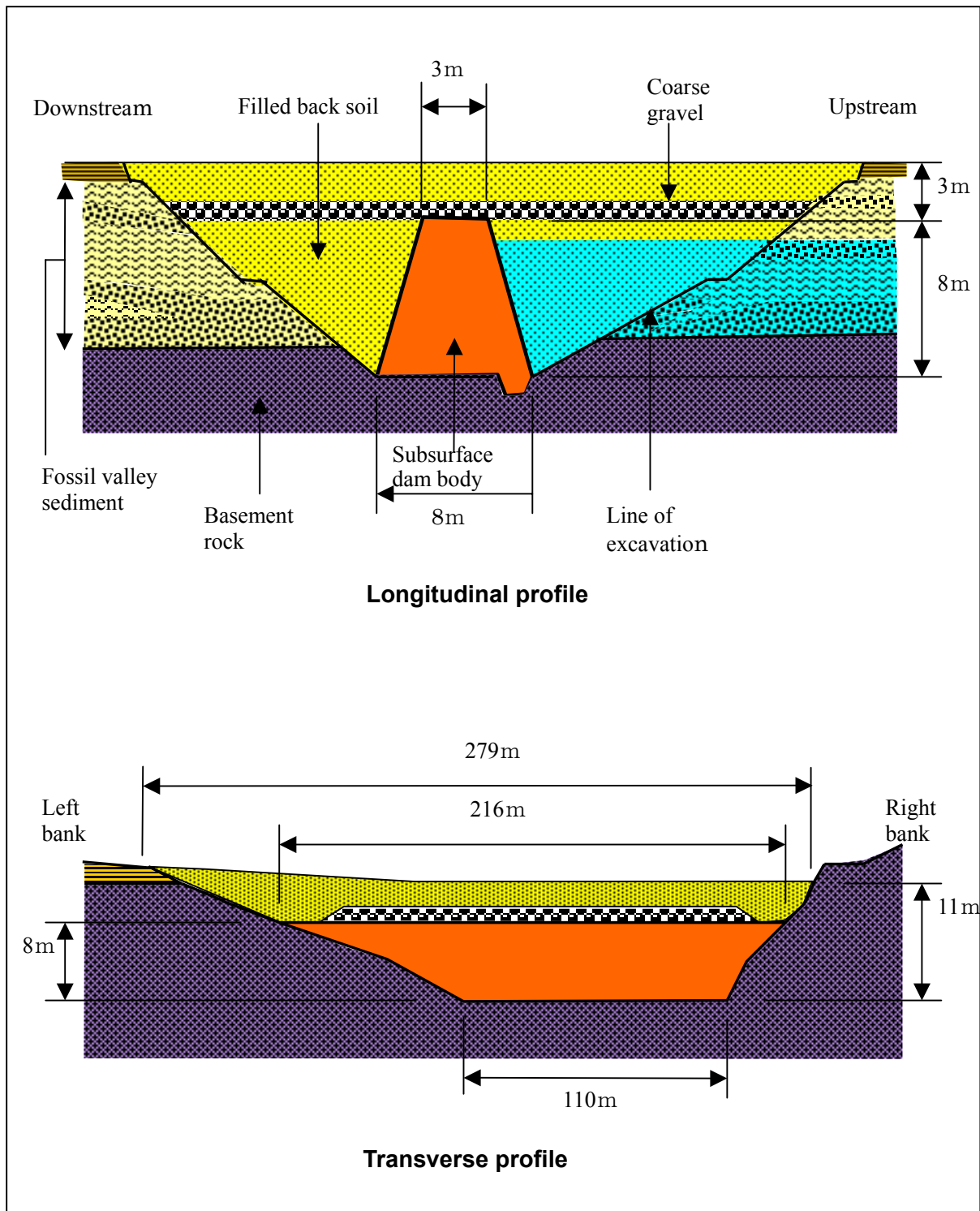


Fig. 4.1: Schematic diagram of the structure of a subsurface dam