Co-funded by the
Erasmus+ Programme
of the European Union

Hydraulic structures. Dams and reservoirs

Embankment dam engineering-1

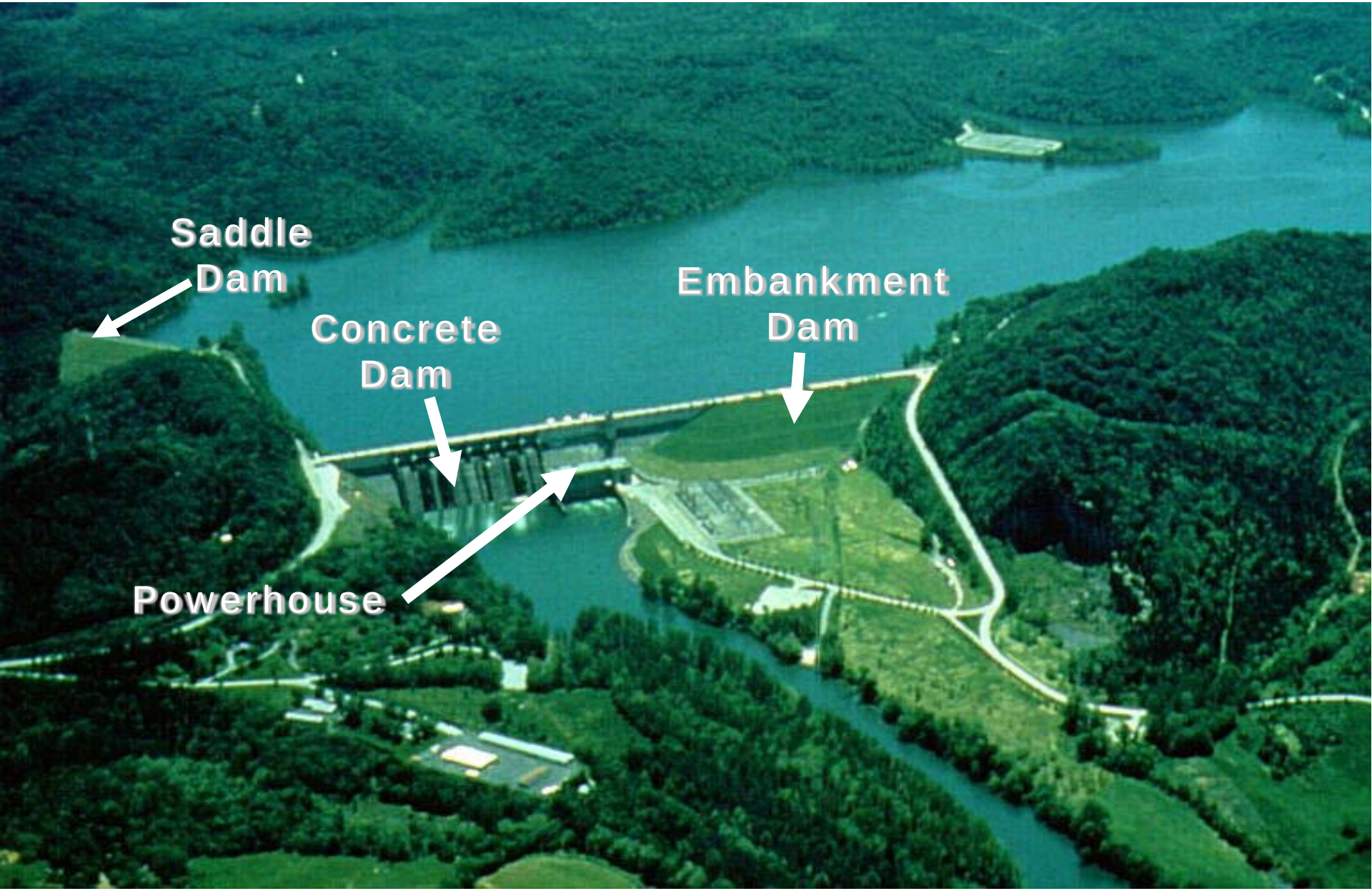
Assoc. Prof. Maria Mavrova
University of Architecture, Civil Engineering and Geodesy - Sofia

Sofia winter School 29 November – 10 December 2021
Date: 7 December 2021

This project has been funded with support from the European Commission. This publication reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Q2: Embankment Dams

Embankment Dams



Embankment Dams

- **engineering soils** - *basic elements of soil mechanics and applied geology*
- **design principles and construction methods** - *seepage, stability and settlement*

Engineering Soils

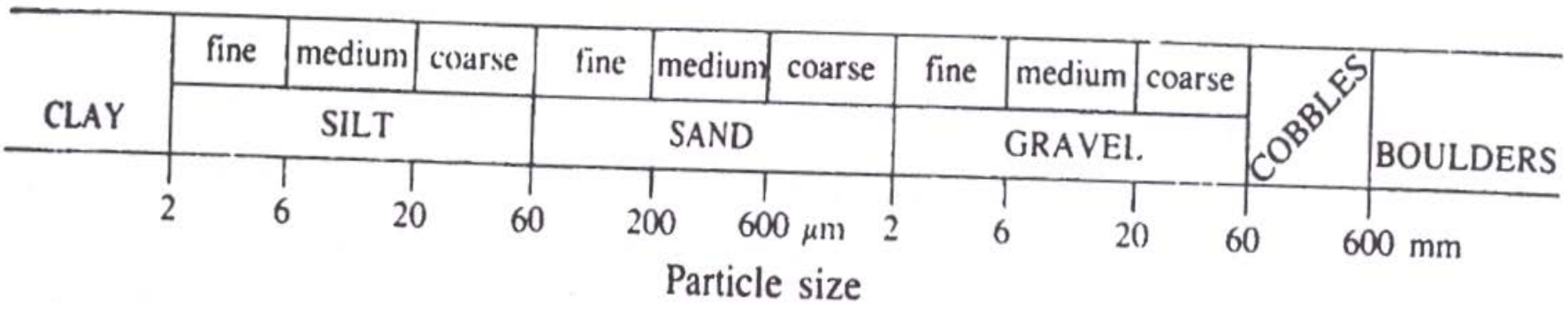
- Soil - a natural aggregate of mineral grains separable by fluid- water, air
- engineering soils of non-organic origin are formed by rock weathering and degradation processes

two generic inorganic soil groups from different weathering processes

- **silts, sands and gravels** - formed from the breakdown of relatively stable rocks by purely physical processes, e.g. erosion by water or glacier, or disintegration by freeze-thaw action.

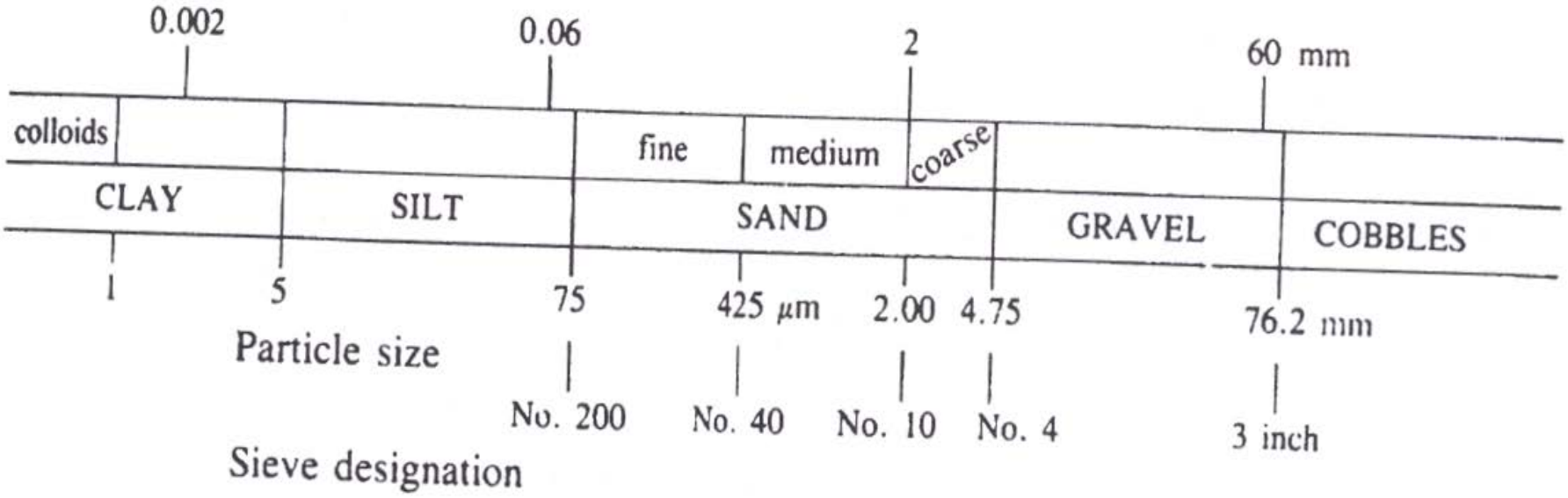
- **clay soils** -rock minerals are chemically less stable, e.g. feldspat, and during weathering, producing clay minerals with strong affinity for water =>**clay soils**: *cohesion, plasticity and sensible to volume change with variation in water content.*

UK classification

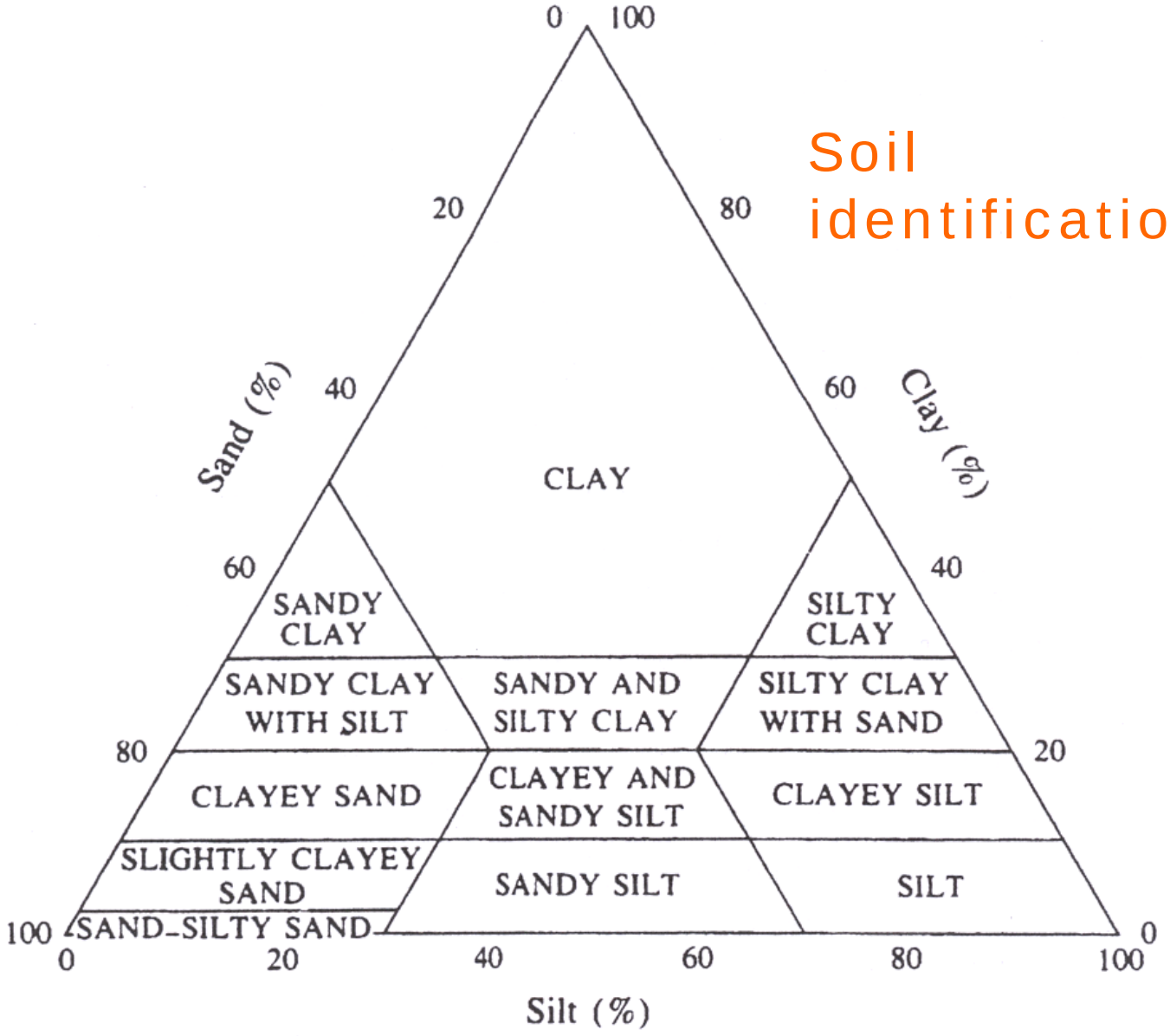


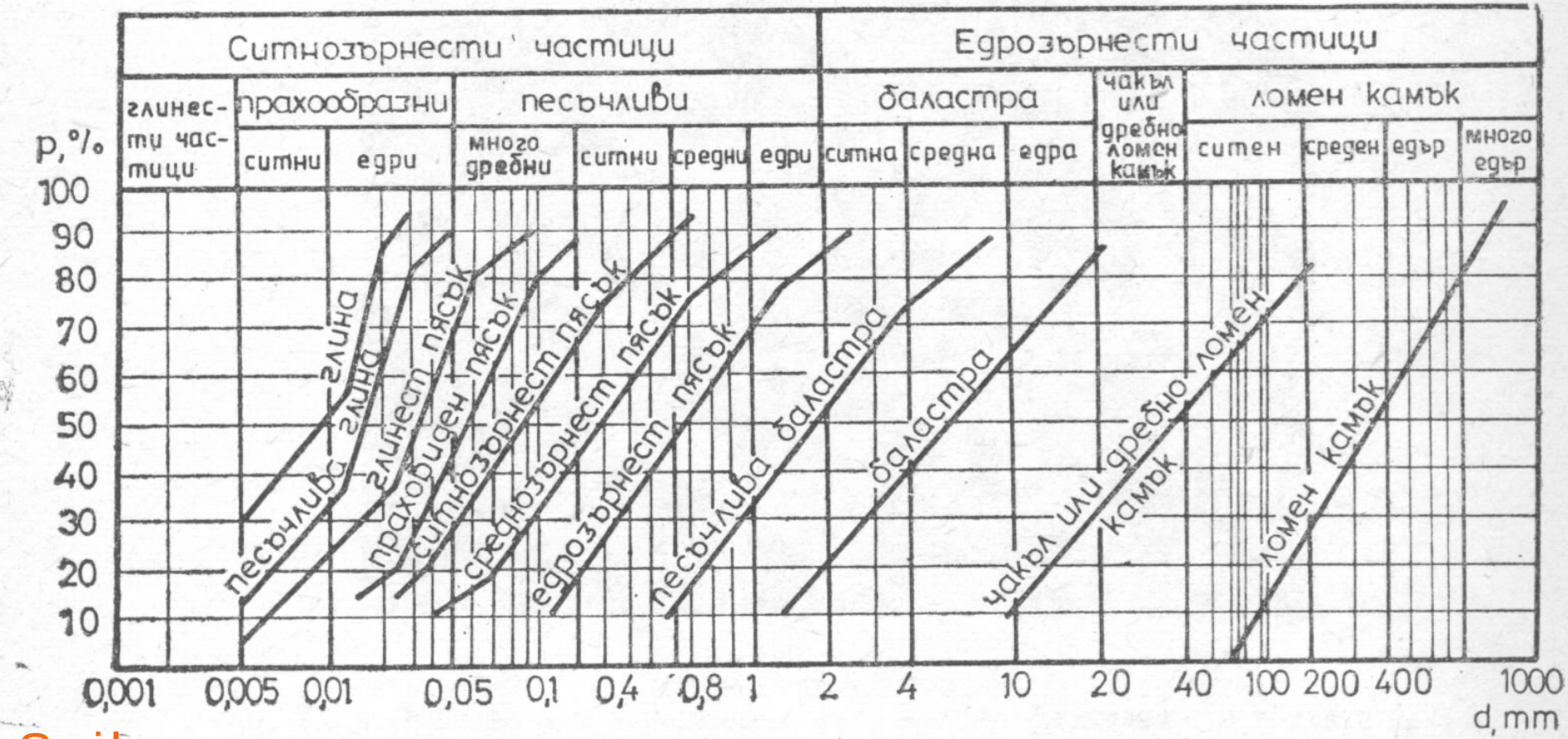
particle size classification

(b) USA (ASTM D422)



Soil identification





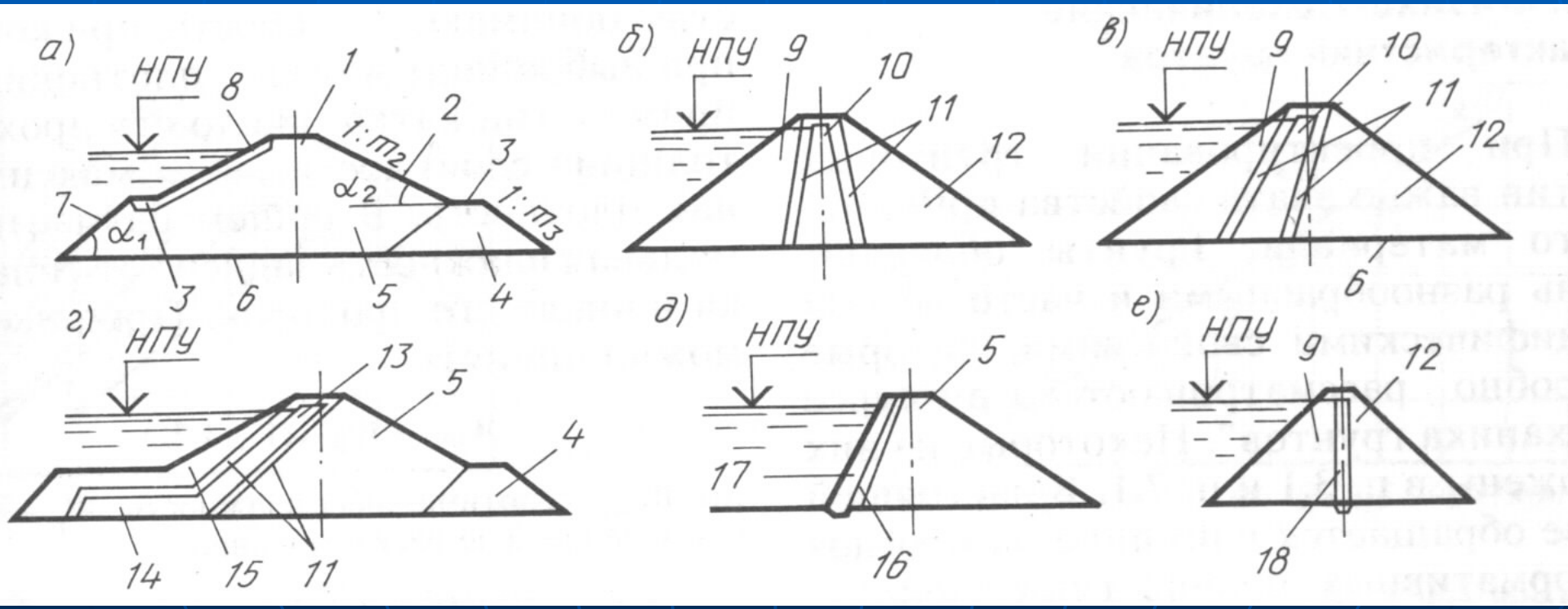
Фиг. 8.1. Криви на зърнометричния състав

Soil identification

Damm Durlaßboden: Österr., 1966, Erddamm, Gründung: Fels/Überlagerung

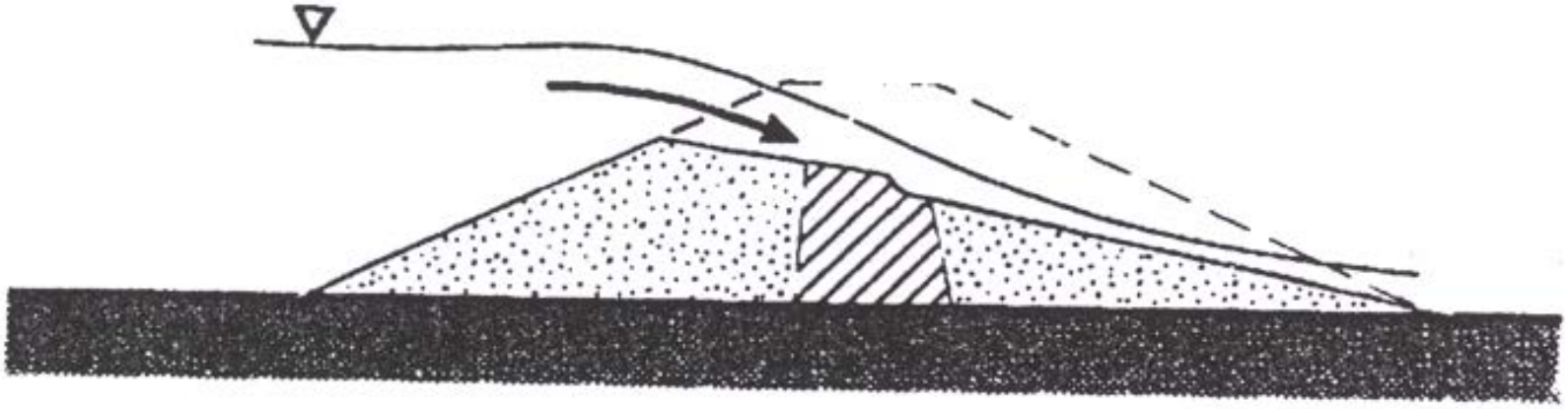
Höhe: 83 m, Kronenlänge: 470 m, Speichervolumen: 53,5 hm^3

Principles of embankment dam design

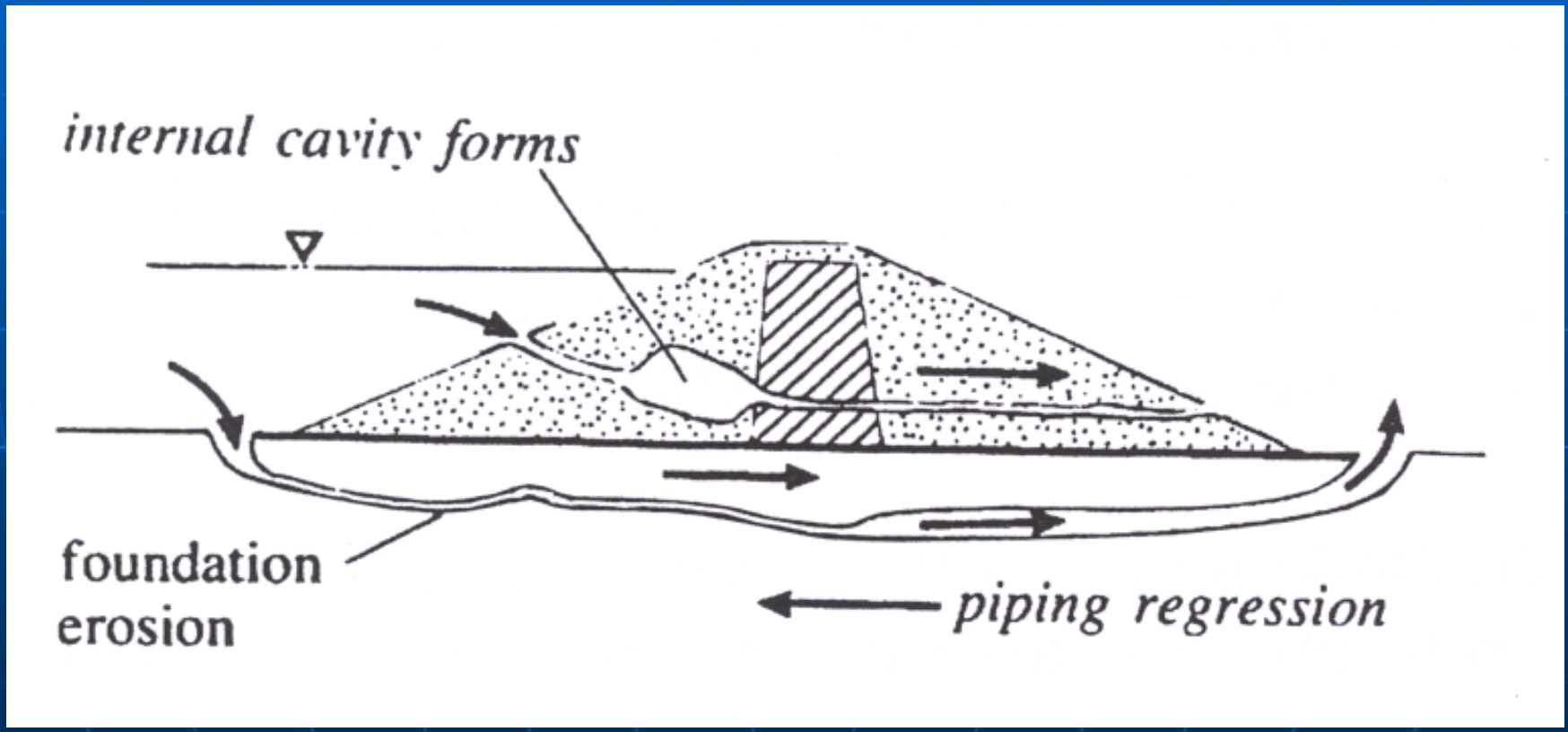


1. Defect mechanisms, failure modes and design principles

overtoping

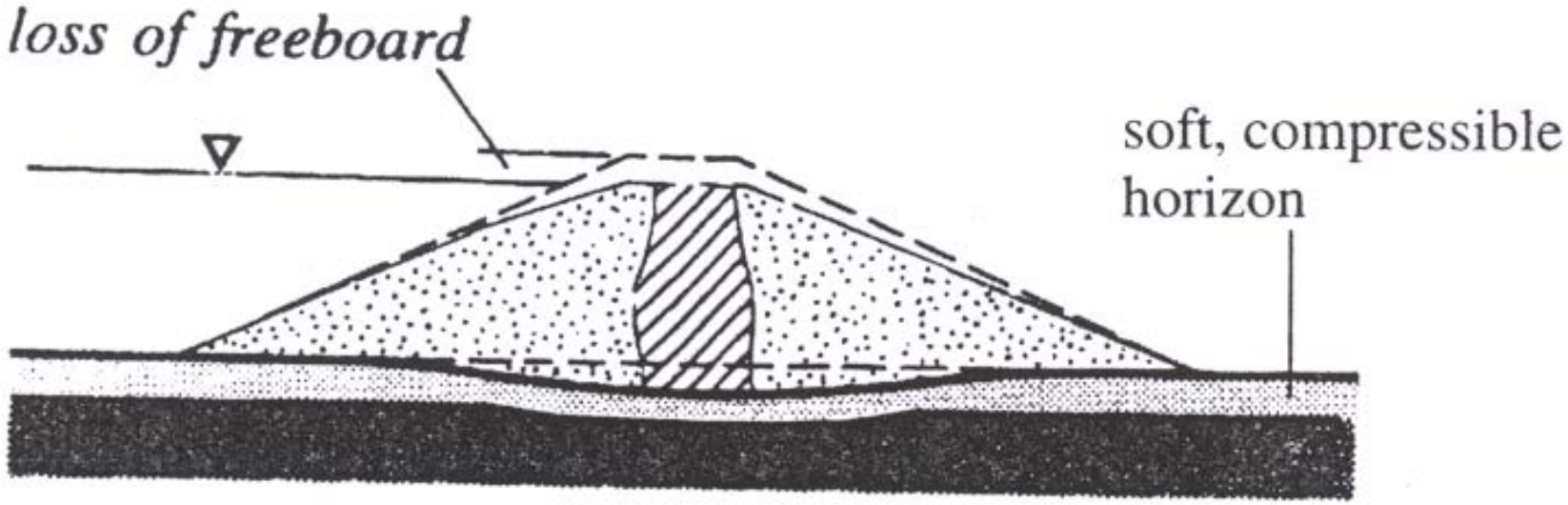


2. Defect mechanisms, failure modes and design principles

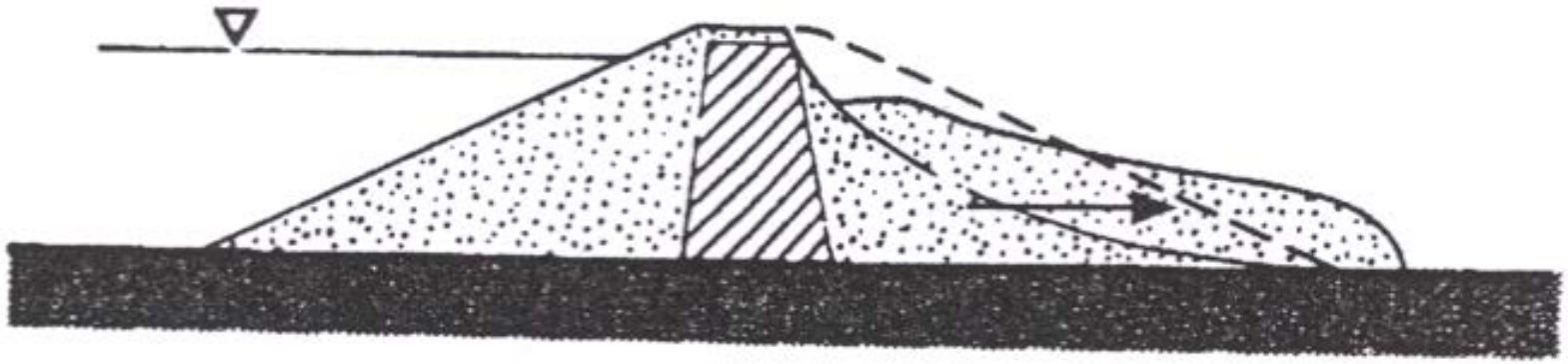


3. Defect mechanisms, failure modes and design principles

settlement



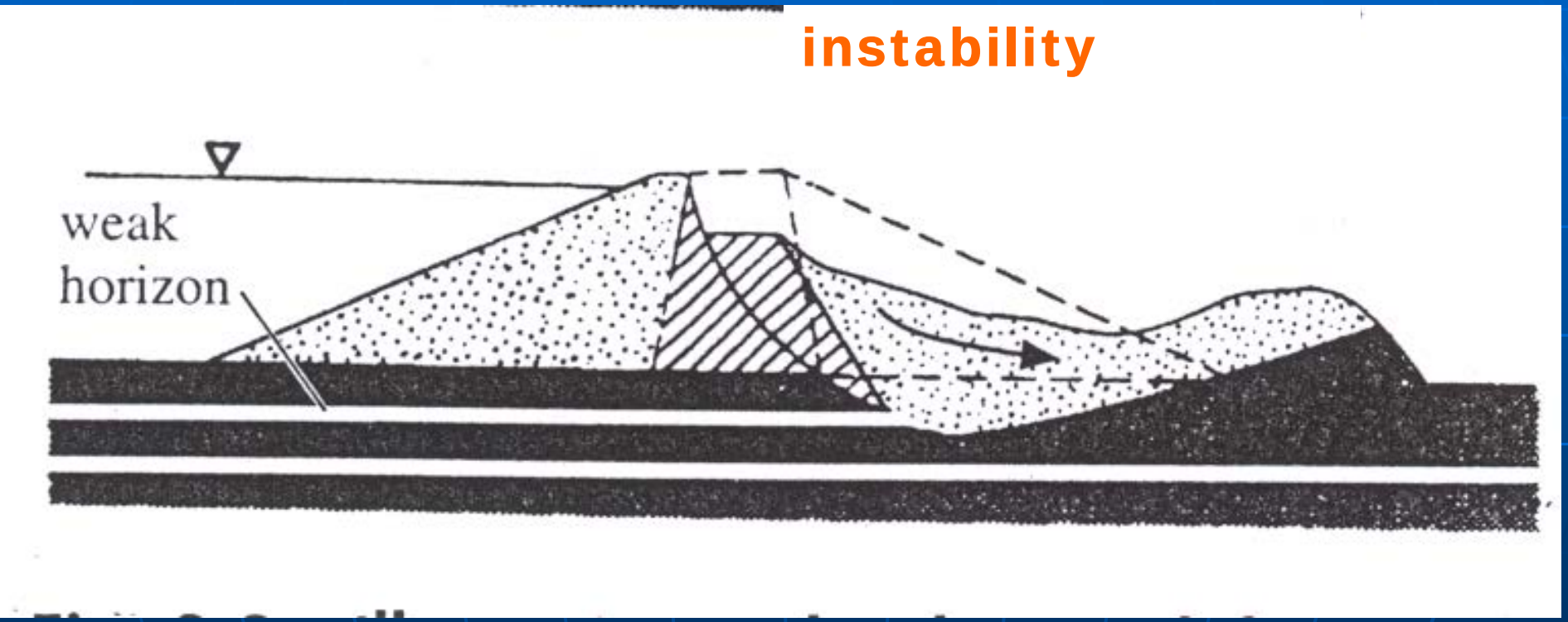
4. Defect mechanisms, failure modes and design principles



instability

5. Defect mechanisms, failure modes and design principles

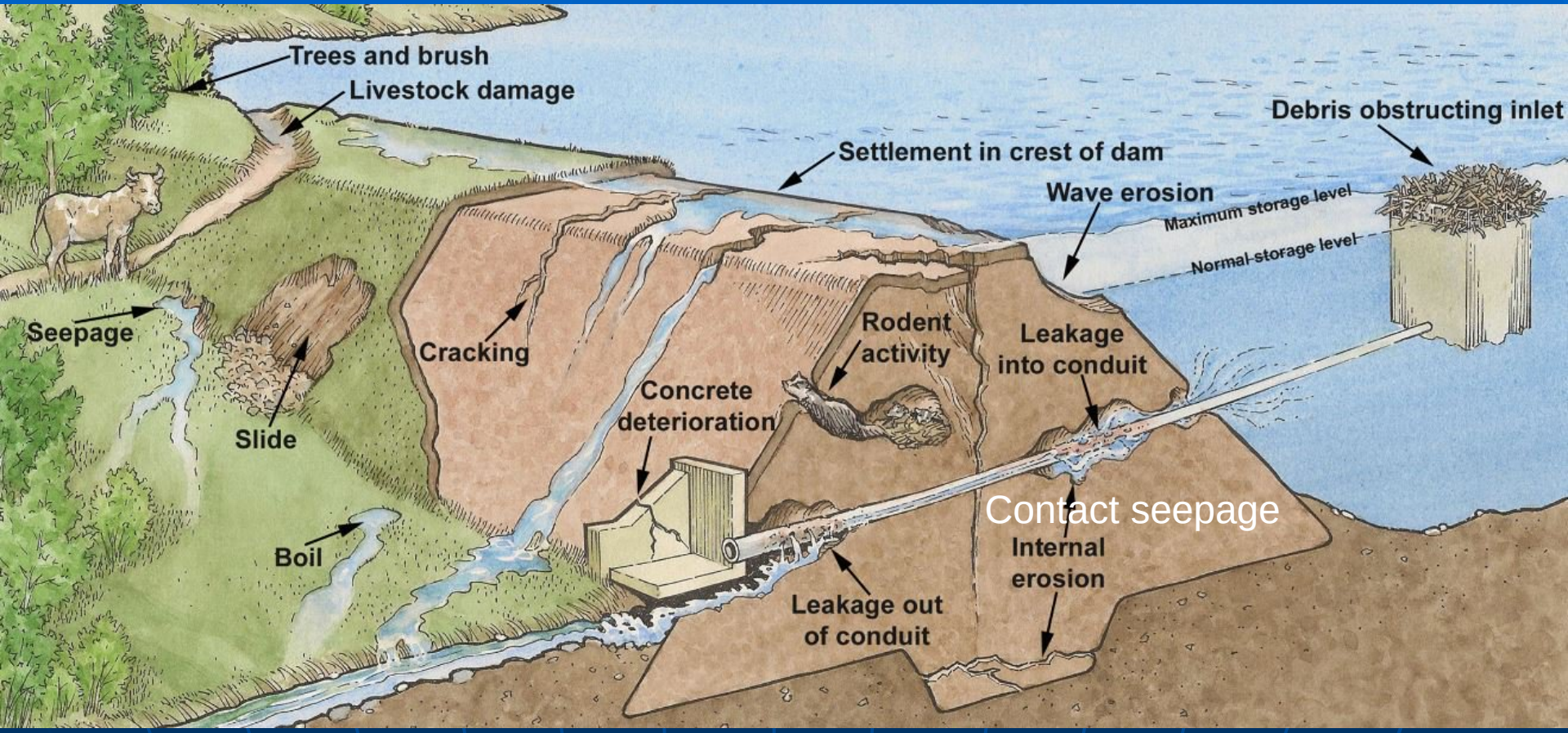
6. Defect mechanisms, failure modes and design principles



!!!Many dams fail where the concrete meets the soil

Contact seepage

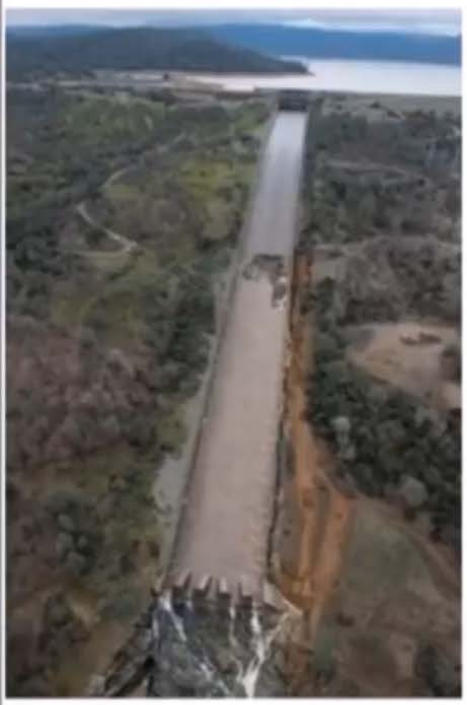
!!!Many dams fail where the concrete meets the soil



!!!Many dams fail where the concrete meets the soil

Oroville Dam, California- 2017

Timeline by ADAPT 2030 YouTube



Feb 10th, 11 AM

Feb 10th , 5 PM

Feb 11th , 5 PM