Bundesanstalt für Wasserbau
Federal Waterways Engineering and Research Institute

BAW Geotechnik

www.baw.de

Geotechnical site investigation

Construction of a navigation lock and weir in Obernau (river Main)

Description of engineering considerations and scope

Lock, weir and powerhouse in Obernau were constructed in 1926 to 1930. Because of damages due to age (80 years) the functionality of the lock can no longer be ensured.
It was decided to build a new lock adjacent to the old lock. The position of the new lock will be located towards the river Main. Thus a change of the general layout is required: Replacement of the weir, construction of a new guard wall, adaption of the left river bank.

The field investigation consists of:
73 boreholes (1200 m fully cored)
53 cone penetration tests CPT (DIN EN ISO 22476-1)
16 heavy dynamic probing tests DPH (DIN EN ISO 22476-2)
5 optical borehole scans
5 packer tests (Lugeon test)
2 dilatometer tests

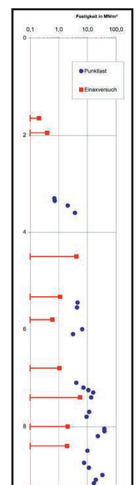
photo of core BKF 316, depth of 12,0 to 17,0 m

80 % of the core samples were taken from the geological formation "lower Buntsandstein" (lithostratific unit "lower Bunter Sandstone"), a sandstone layer of the Lower Triassic. Close to ground surface the sandstone is fully disintegrated and may be defined as clay-bound sand.

vessel (carrying drilling equipment)
85 % of the investigation points were located in the river bed

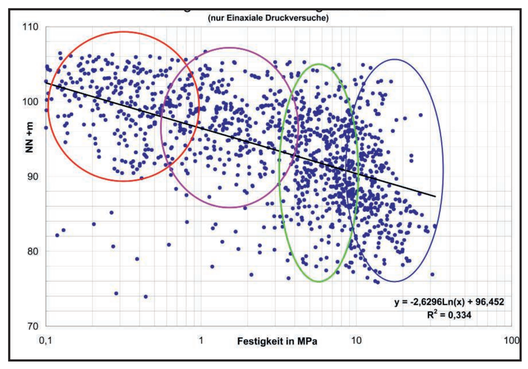
Unconfined compression test at a fully disintegrated sandstone (FG 1)

Vertically inclined fissure located in sandstone, BKF 301

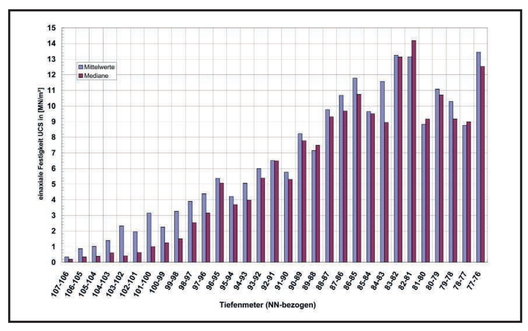


Profile of strength, BKF 402

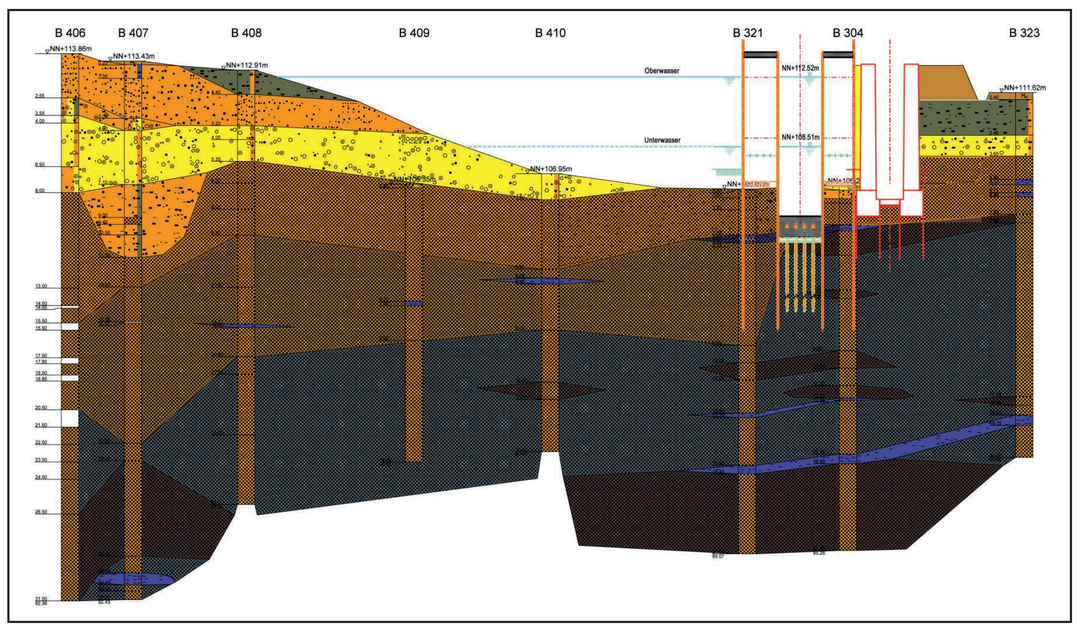
point load test (PLT) and unconfined compression test (UCT)



Measured unconfined compressive strength (UCS) over depth (mNN)



Mean values of UCS over depth (mNN)



Geological section (upstream)

Main focus of the laboratory tests was to determine the strength dependency with depth. Four classes of strength (extremely weak to weak, according to DIN EN ISO 14689-1) were defined using unconfined compressive strength UCS (q_u):
Strength class 1 (FG1): q_u < 1 MPa (extremely weak)
Strength class 2 (FG2): 1 MPa < q_u < 5 MPa (very weak)
Strength class 3 (FG3): 5 MPa < q_u < 10 MPa (weak (1))
Strength class 4 (FG4): q_u > 10 MPa (weak (2))

The lower Buntsandstein is predominantly fully disintegrated and contains numerous fissures. Partially it is classified as "cemented sand-silt-mixture" (FG 1), partially it is clay-bound (FG 2) but may be worked with a knife. Other parts are bound by quartz, cavernous but nevertheless hard (FG 3 or 4).

16. - 18. Mai 2011 · contact: Michael Pietsch · Department Geotechnical Engineering · Tel.: 0721 9726-3920 · michael.pietsch@baw.de