MeSy® *Stress measurements*

SOLEXPERTS

NoRSTRESS Seminar 2021

Knowledge Sharing in Rock Stress Measurements

MeSy® Wireline Approach for HF/HTPF-Testing

- technical details and case study -

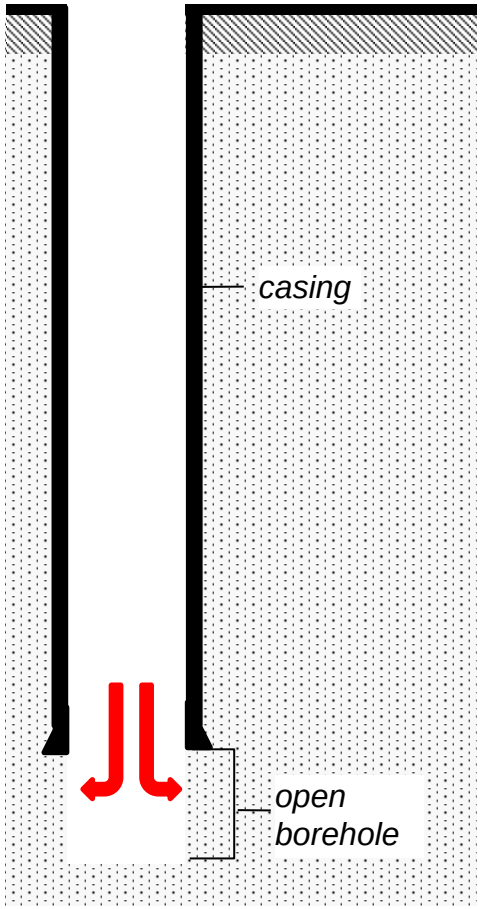
Gerd Klee

Hydrofrac Test Demonstration 1969

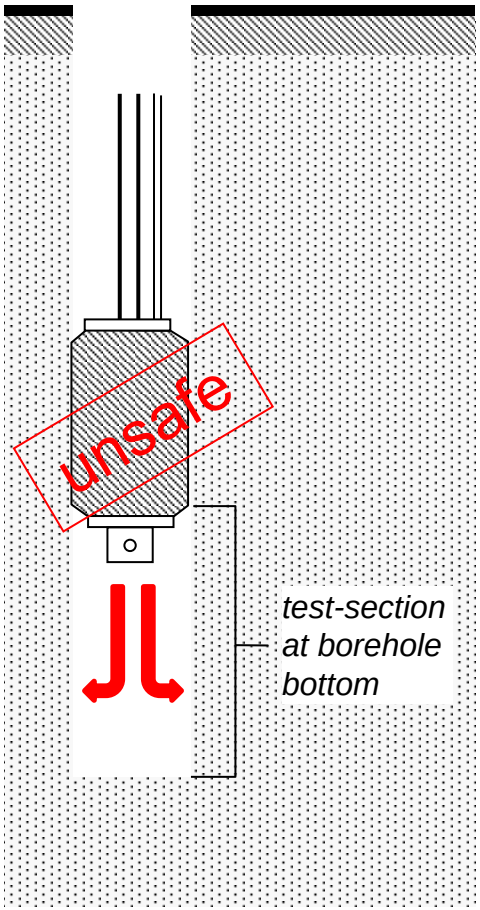
granite quarry in N-Minnesota

Hydrofrac Practice: open-hole vs. packer tests

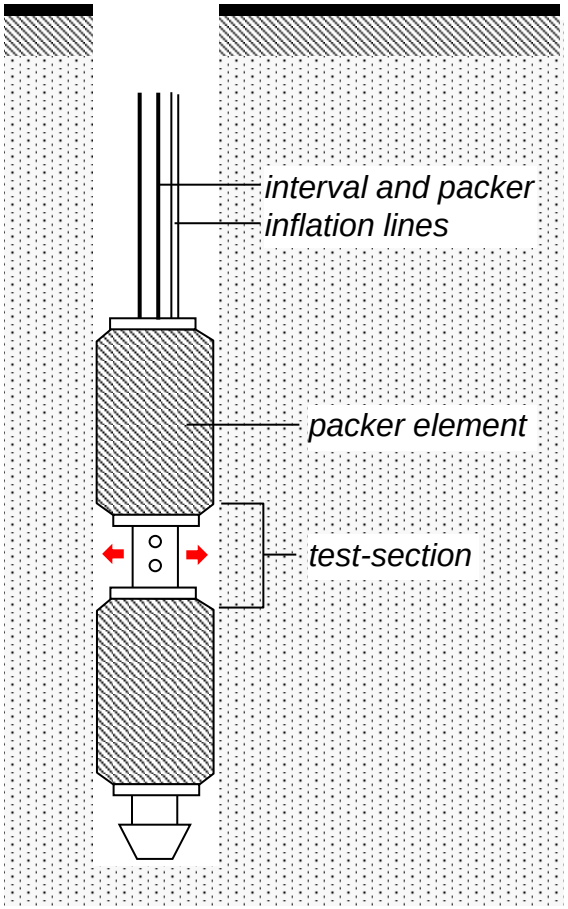
open-hole (LOT)



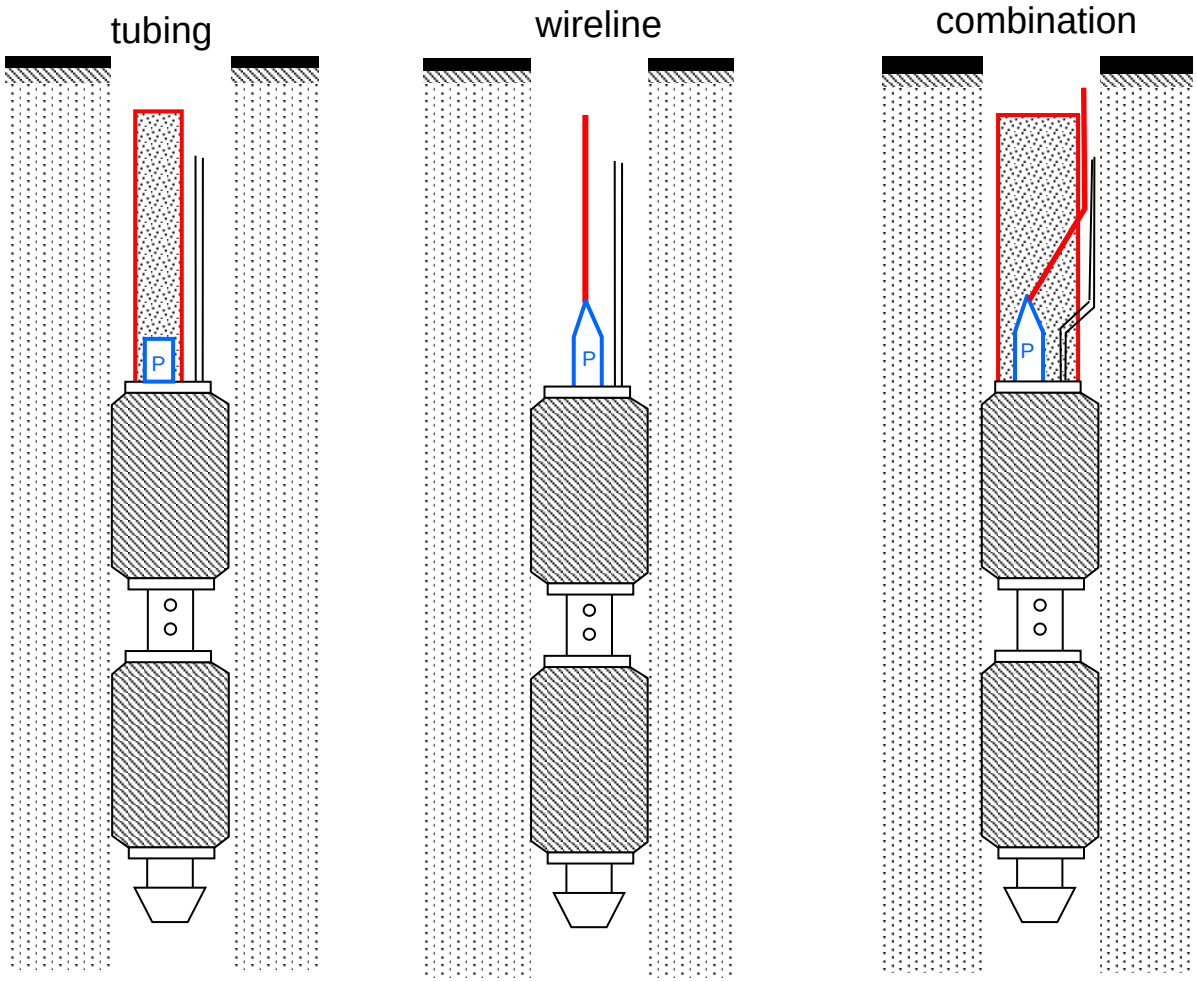
single packer



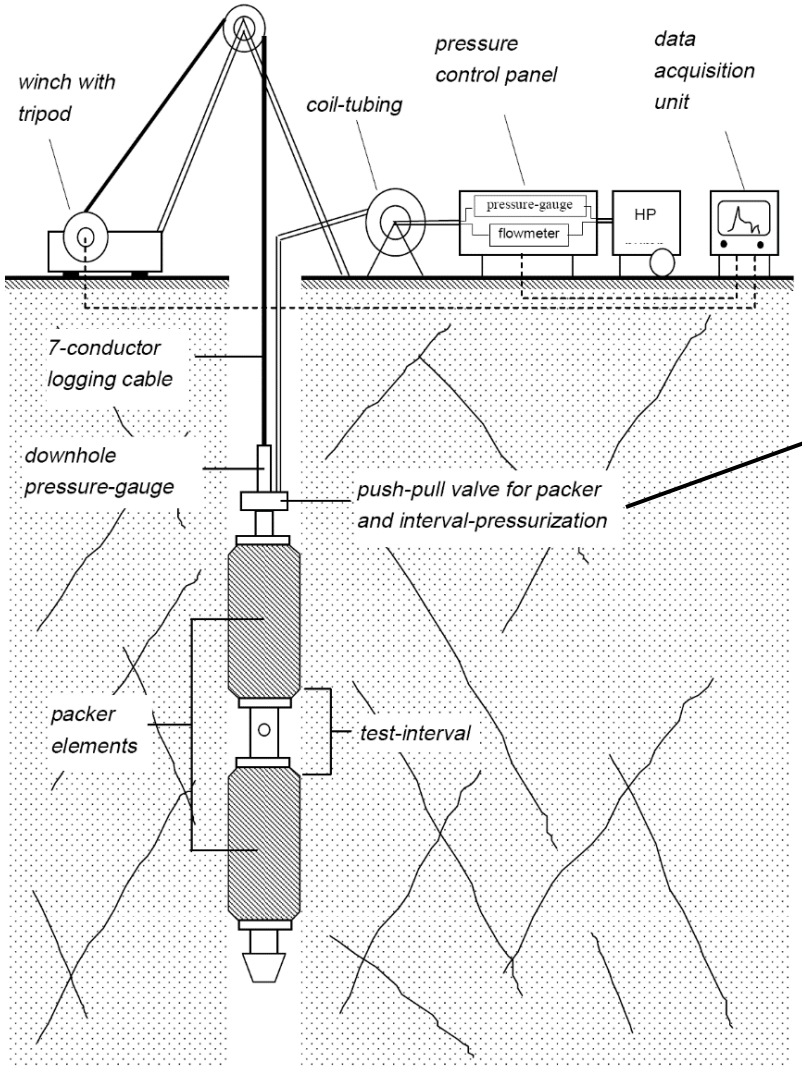
double straddle packer

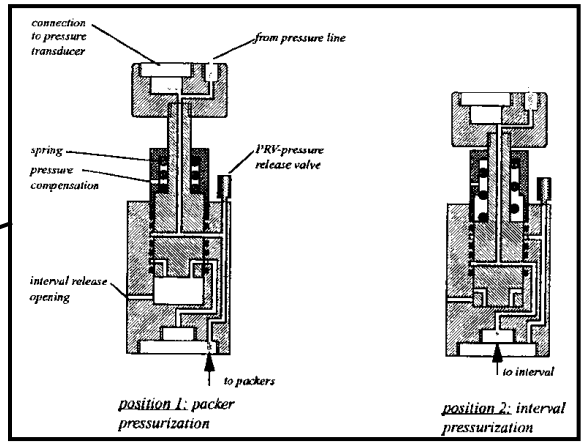


Hydrofrac Practice: packer conveyance



Wireline Hydrofrac System





disadvantage
- limited pull-out force

advantages
- ✓ no drill-rig/crew necessary
- ✓ downhole pressure monitoring
- ✓ high system stiffness dP/dV
- ✓ fast (impression packer testing)


Borehole Blanche-1, Australia


Ingula PSP, South-Africa

Bakhtyari HPP, Iran

Neltume y Choshuenco HPP, Chile

Rapay HPP, Peru

Hydraulic-Fracture Testing for the Xe Pian - Xe Namnoy HPP

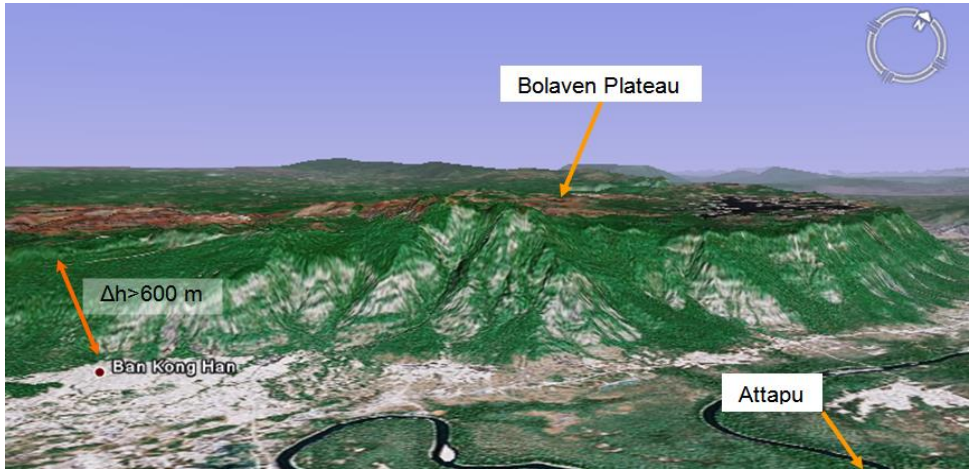
R. Longden (AF Consult Switzerland Ltd.) and G. Klee (MeSy-Solexperts GmbH)

ARMS9 Bali 2016

18-20 October 2016, Bali, Indonesia

Project

- The project area is located on the Bolaven Plateau in Southern Lao PDR, approximately 550 km from the capital Vientiane, 80 km east from Pakse and 35 km west from Attapeu.
- Bolaven Plateau lies on elevation between 720 and 1300 m a.s.l., over 600 m above the surrounding valleys of the Xe Kong and the Mekong Rivers.



Source: Google Earth 2007

Schematic Project Layout

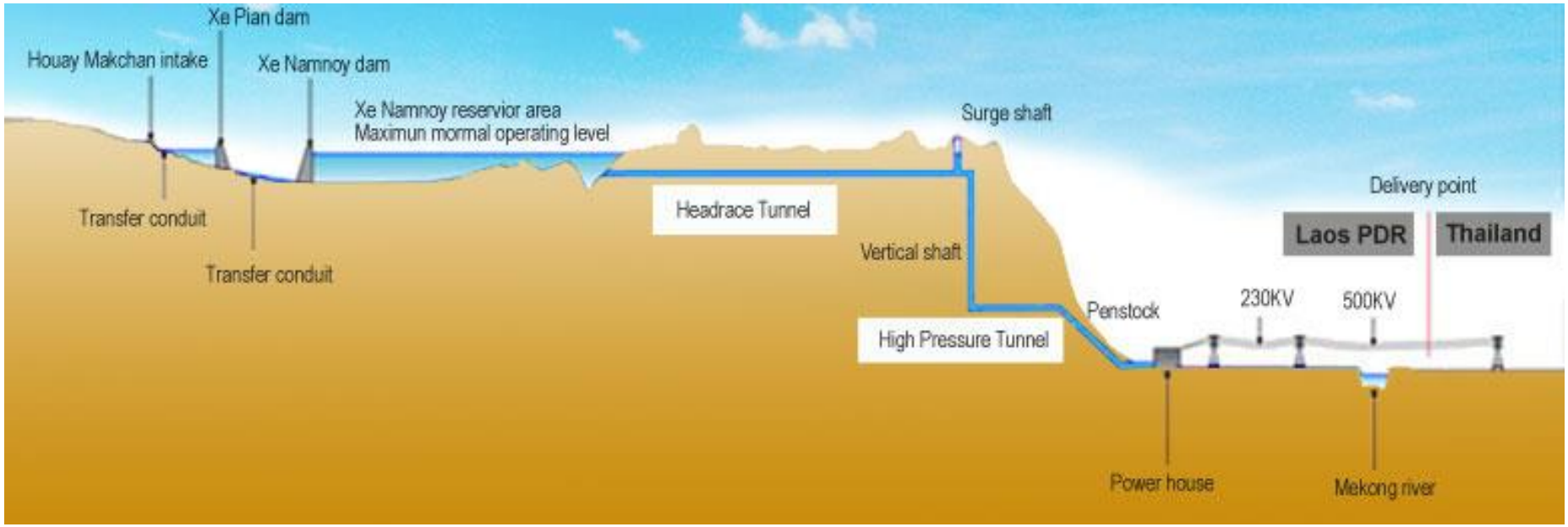
Houay Makchan → Xe Pian → Xe Namnoy → Powerhouse → Xe Kong

Transfer conduit 0.95 km

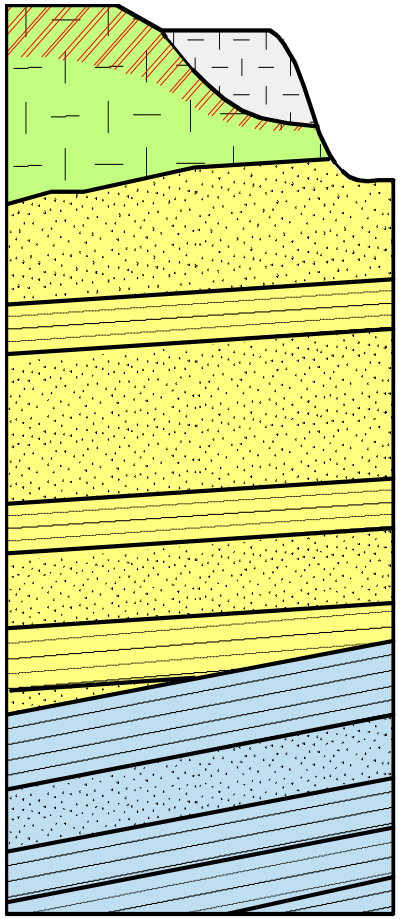
Transfer conduit 8.4 km

HRT 13.7 km (∅: 5 m)
Vertical shaft 485 m (∅: 4.4 m)
HPT 1.6 km (∅: 3.6 m)
Penstock 730 m (∅: 3.6 m)

Tailrace channel 6.2 km

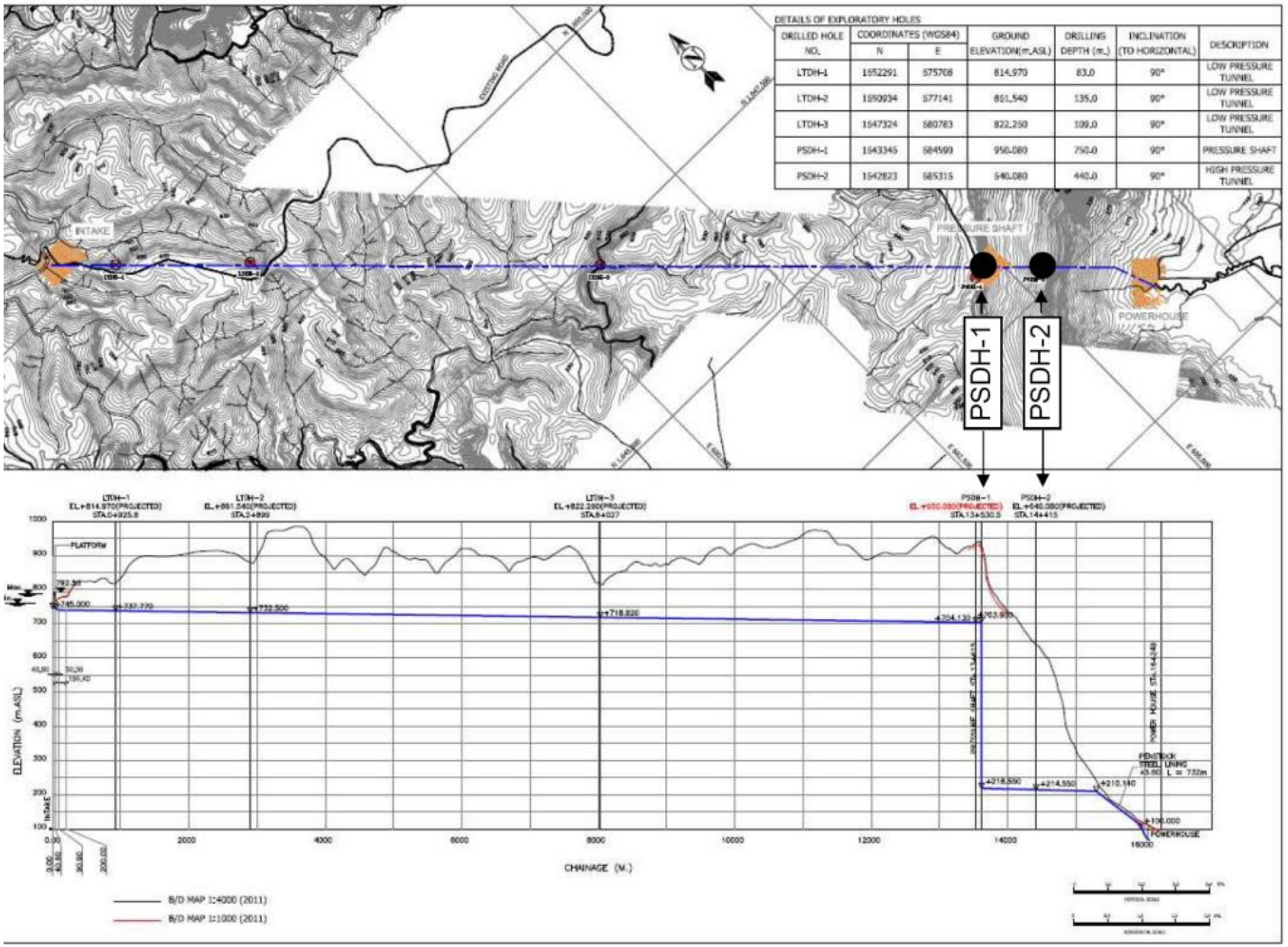


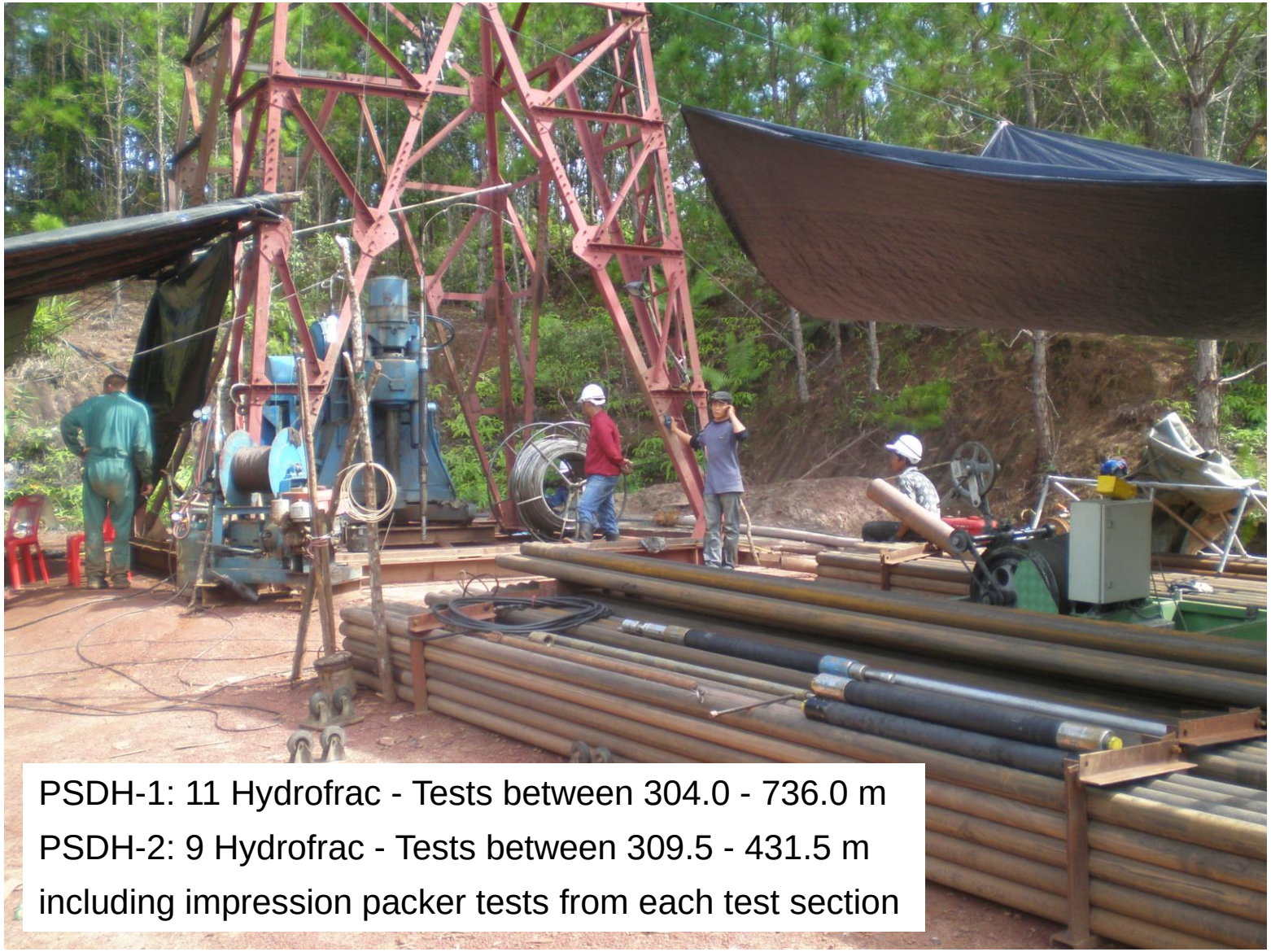
Schematic Project Layout



Quaternary	Basalt	Basalt flows in valleys and depressions
Pliocene – Pleistocene	Basalt and Laterite	--- *Weathering (Laterite) and erosion* --- Several widespread Basalt flows
Upper Jurassic – Cretaceous	'Champa formation'; Sandstone and Siltstone, Conglomerates	Stronger formation building the near vertical cliffs of the escarpment, gently folded
		----- Unconformity -----
Lower – Middle Jurassic	'Tholam formation'; Siltstone, Clayshale and Sandstone	Weaker formation in the lower part of the escarpment

Borehole Location

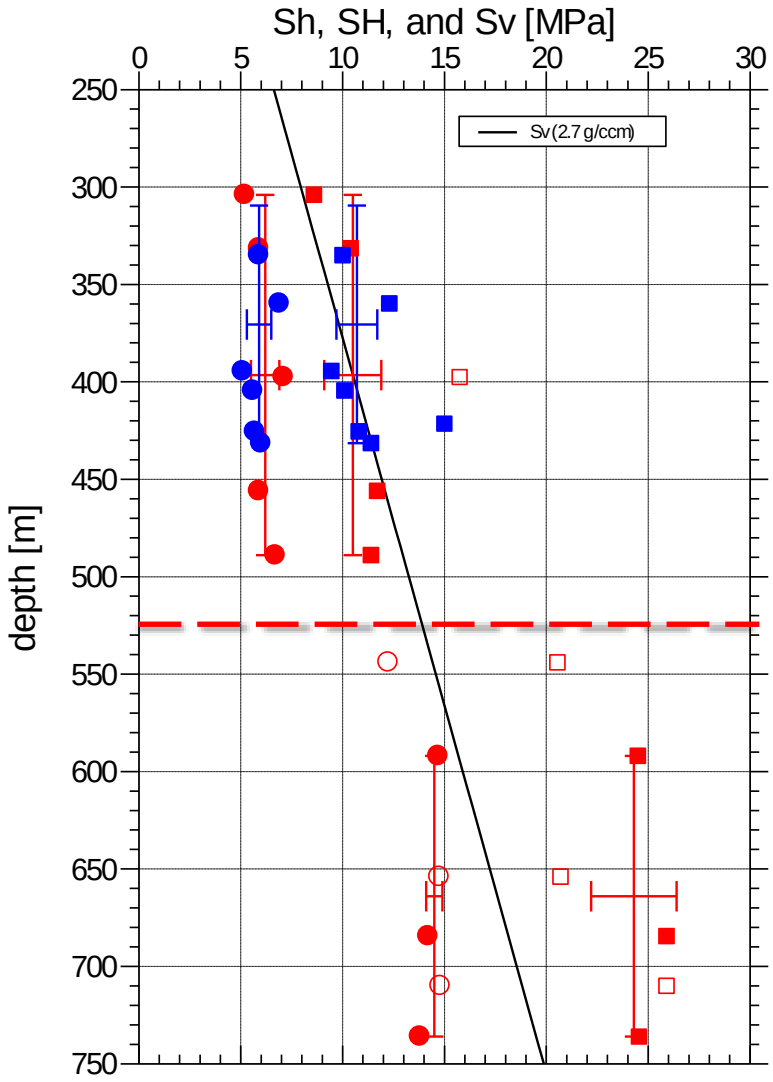




PSDH-1: 11 Hydrofrac - Tests between 304.0 - 736.0 m

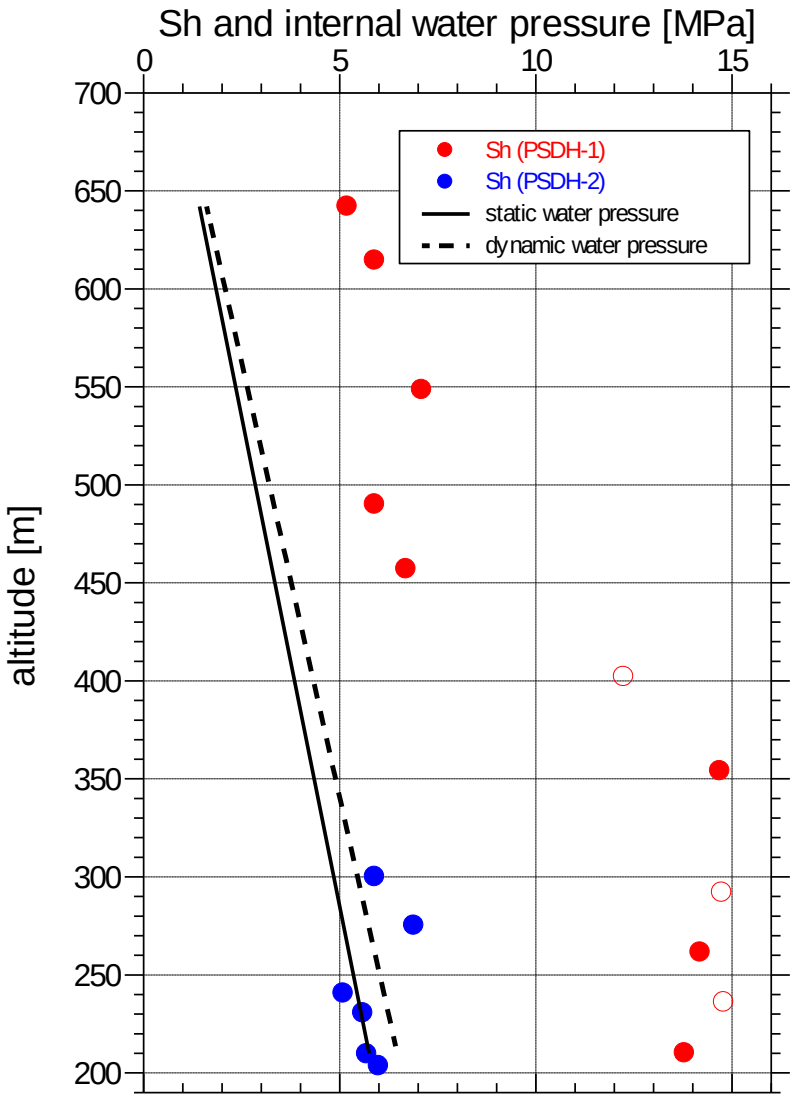
PSDH-2: 9 Hydrofrac - Tests between 309.5 - 431.5 m

including impression packer tests from each test section



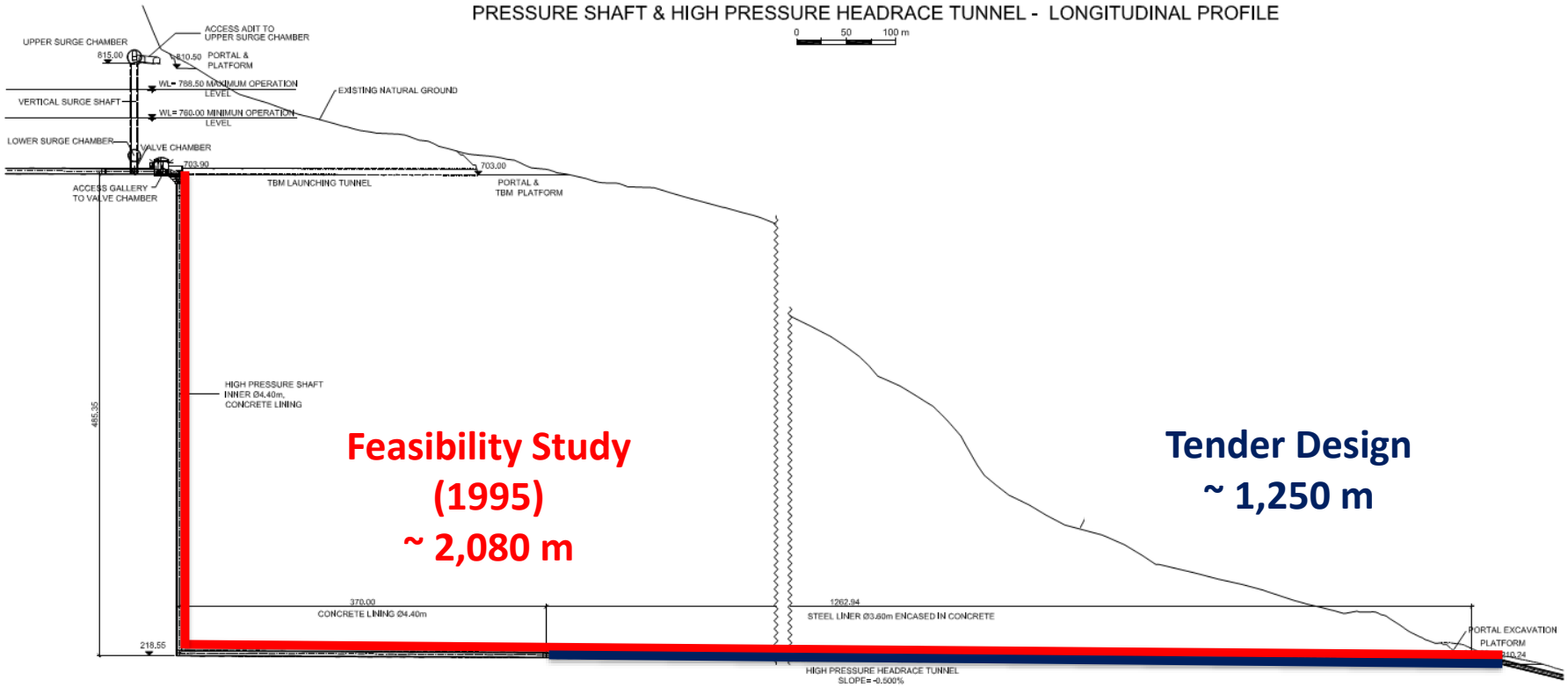
Principal stresses in borehole PSDH-1 (red symbols) and PSDH-2 (blue symbols), circles: S_h, squares: S_H)

Unconformity



Minimum principle stresses and internal water pressures vs. elevation

Steel Liner Requirement




Thanks for your attention !
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