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HVA SKJER I VEGKONSTRUKSJONEN NÅR GRUNNVANNSTANDEN ØKER?

[Pavement degradation as ground water increases]

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Full scale accelerated pavement test

Heavy vehicle simulator (HVS):

An accelerated, full scale loading facility that accelerates pavement failure by simulating many years of traffic loading in a few months.

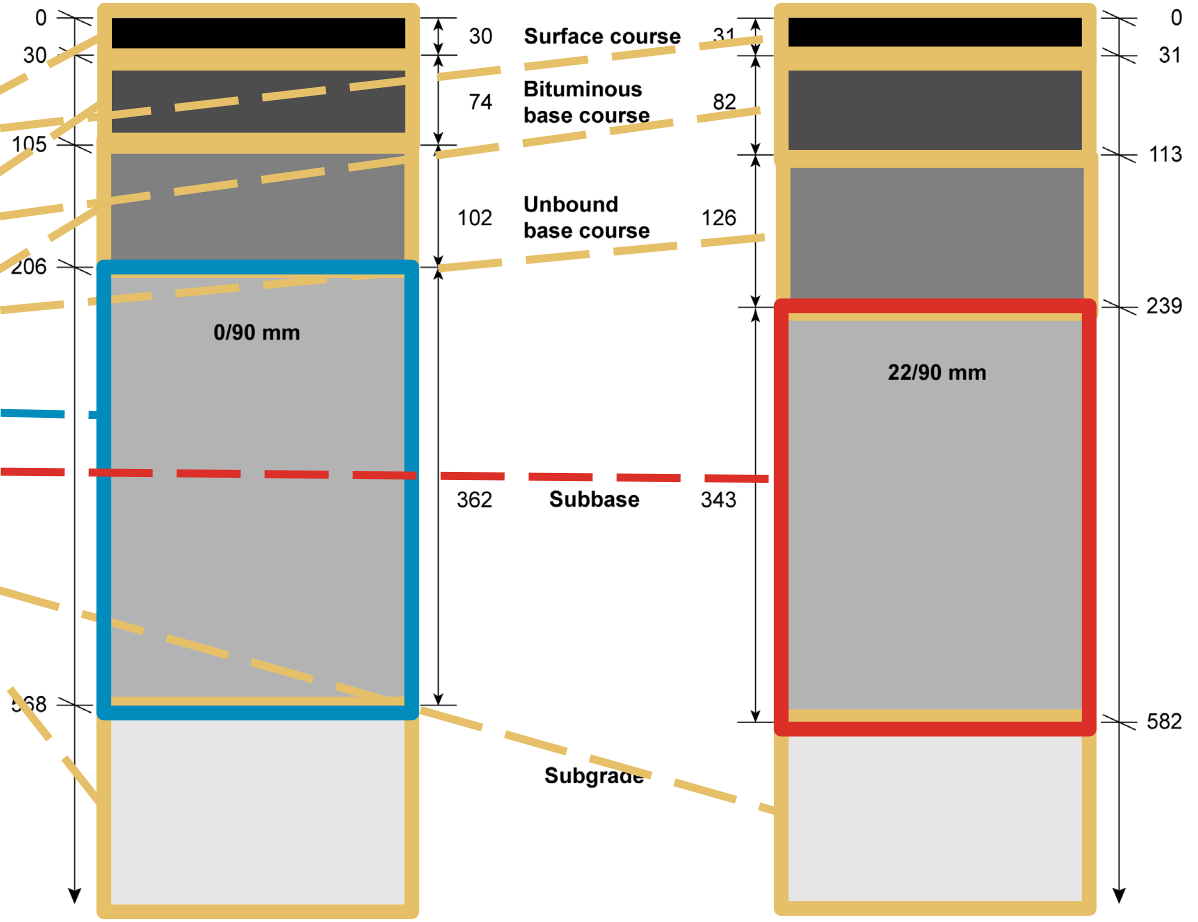
Conditions:

- Test pit: 15 x 5 x 3 m
- Dual-wheel load 60 kN = 12 tonne axle load
- Tyre pressure 800 kPa
- Up to 20 000 passes per day
- Constant temperature 10 °C

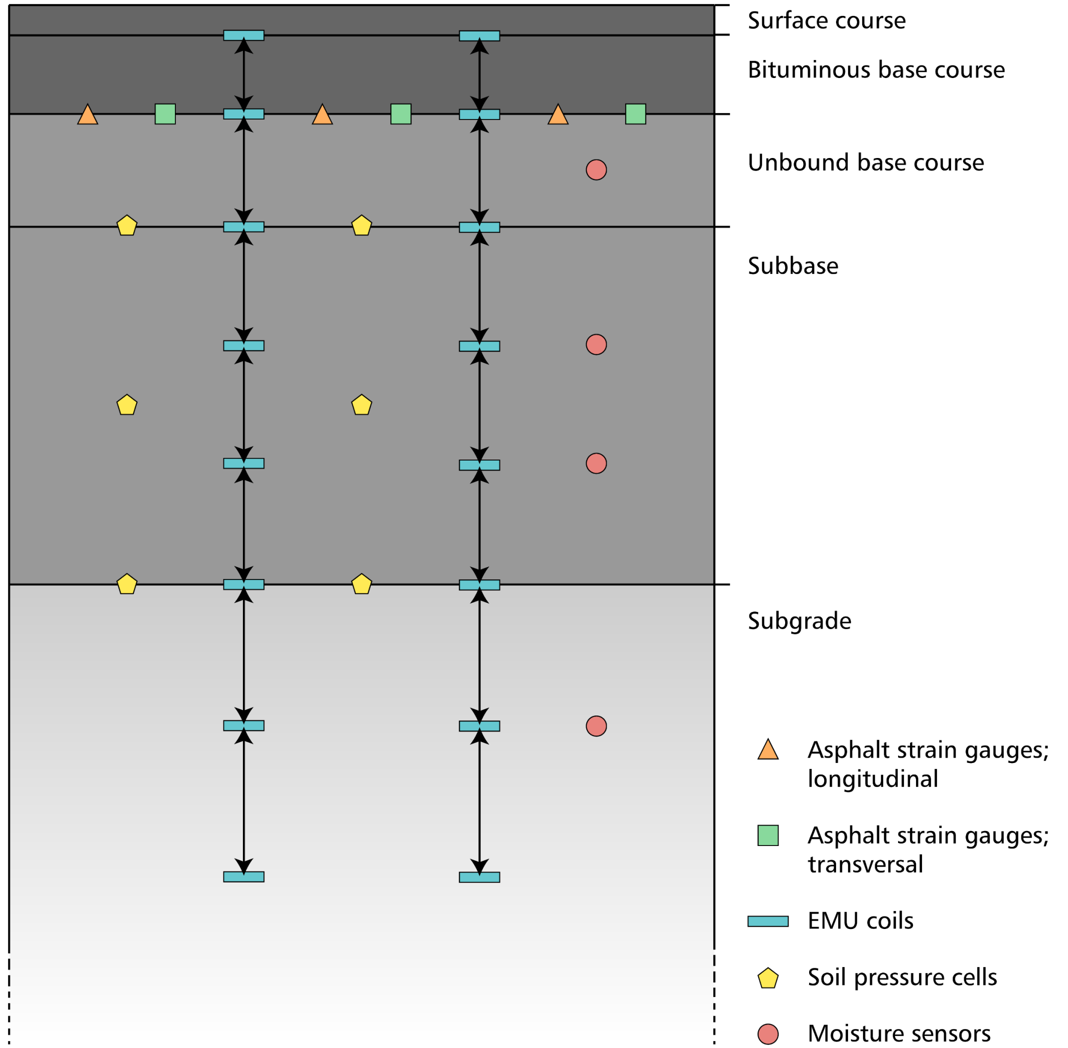
VTI, (YouTube)

Pavement structures

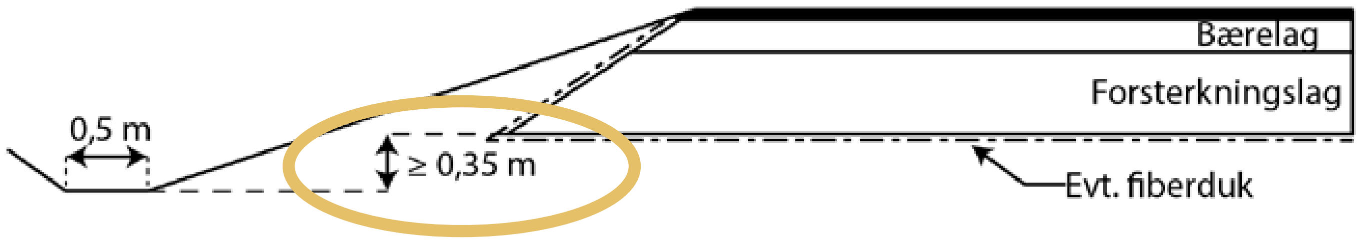
■	Surface course	AC 16 mm
■	Bituminous base	AC 22 mm
■	Unbound base	0/32 mm
■	Subbase	0/90 mm 22/90 mm
■	Subgrade	Silty sand



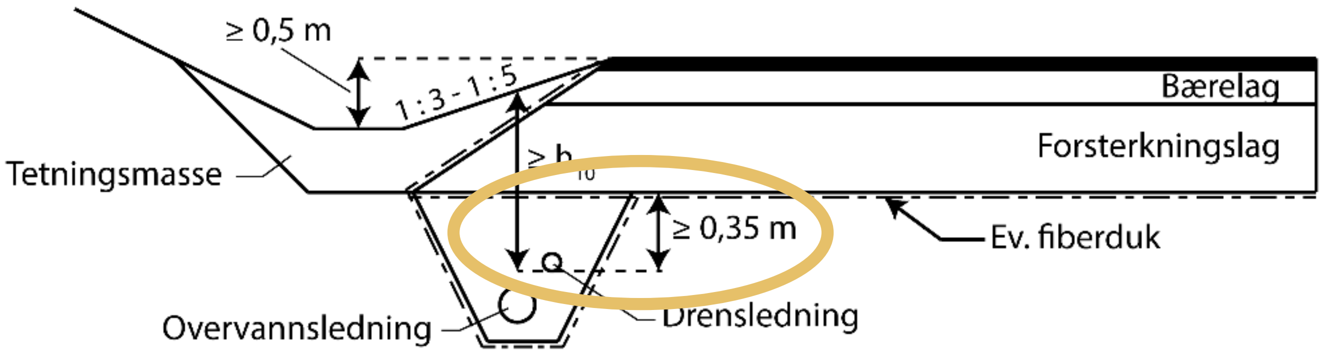
Instrumentation of pavement structure



Drainage level – national requirements



N200 fig. 406.1



N200 fig. 406.2

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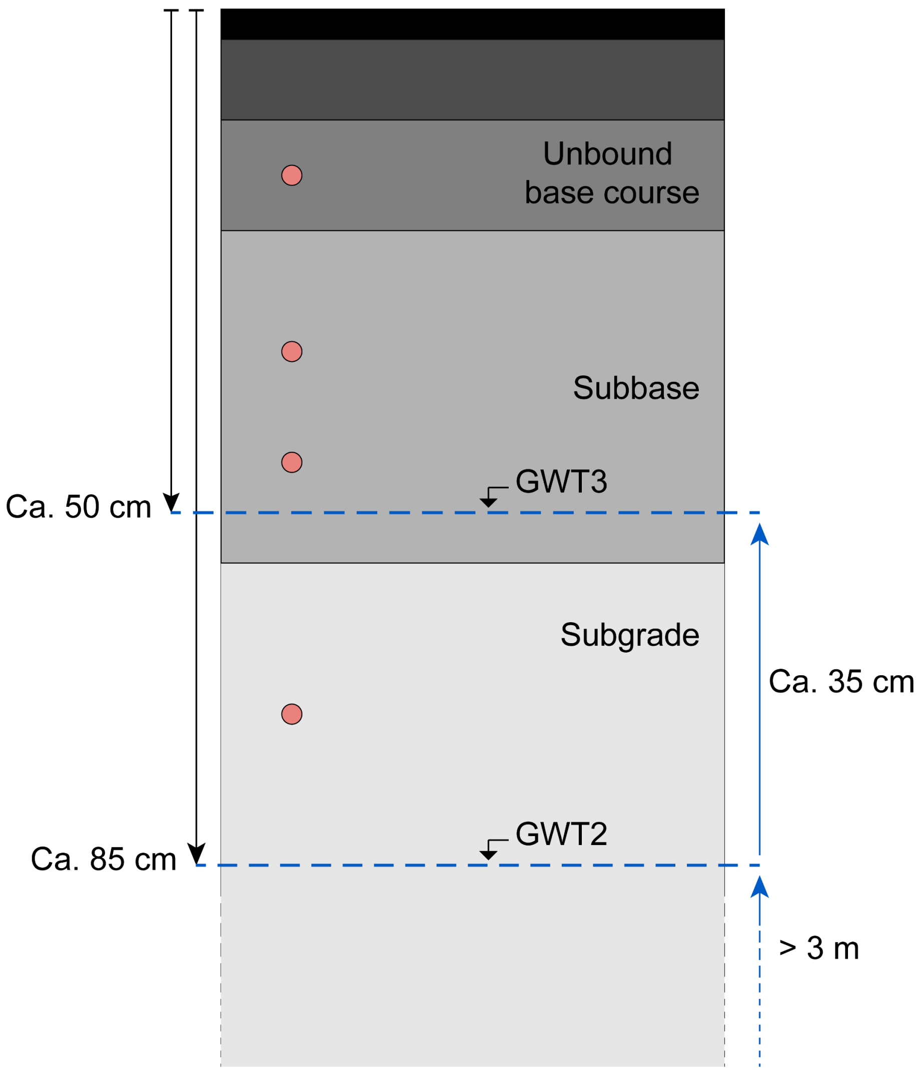
Ground water levels

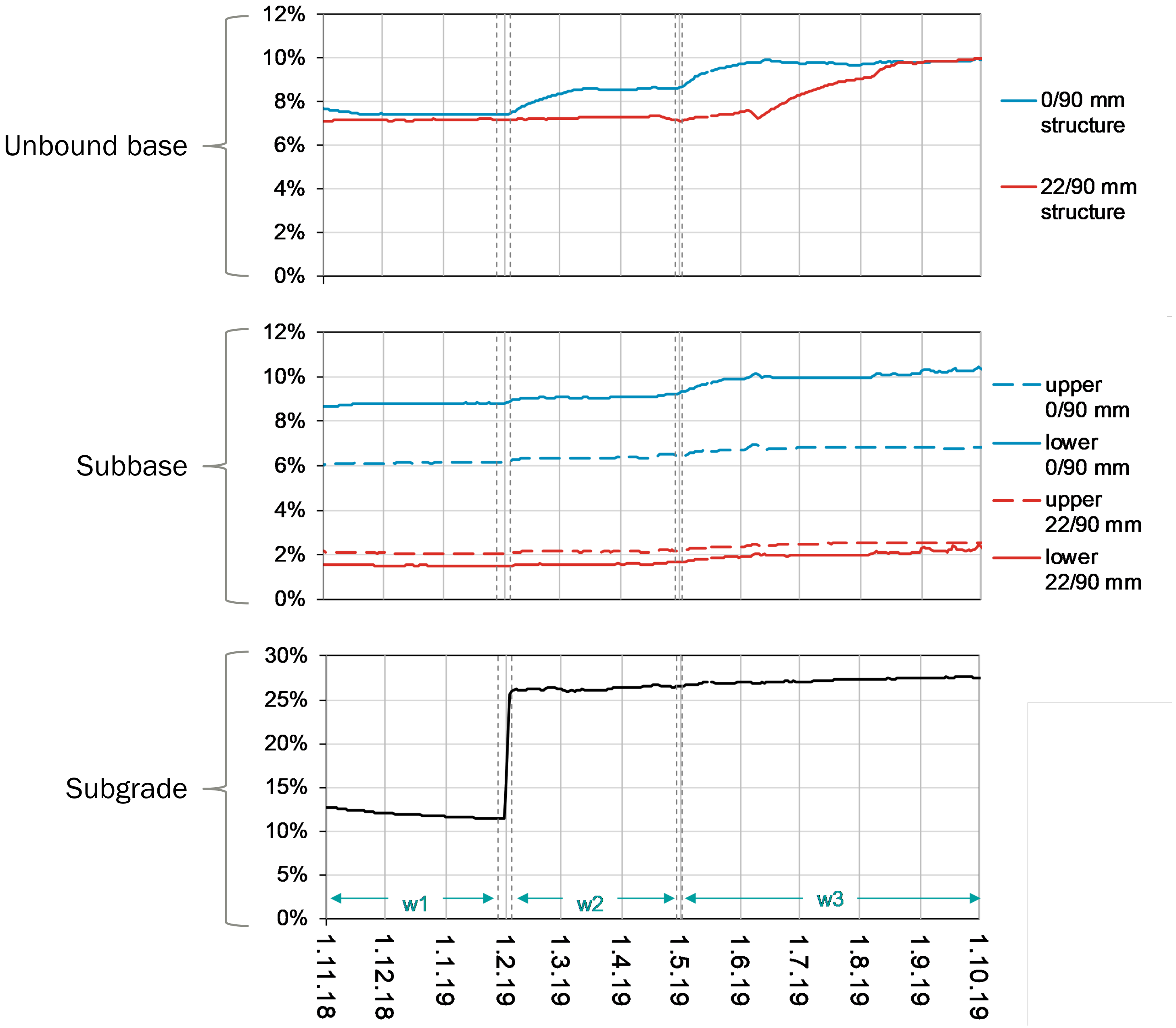


GWT1: (Ground water table 1)
More than 3 m below surface

GWT2:
At normal drainage level 30 cm below subbase layer

GWT3:
3-5 cm into subbase layer – simulating overloaded drainage system

Volumetric water content registered by moisture sensors:



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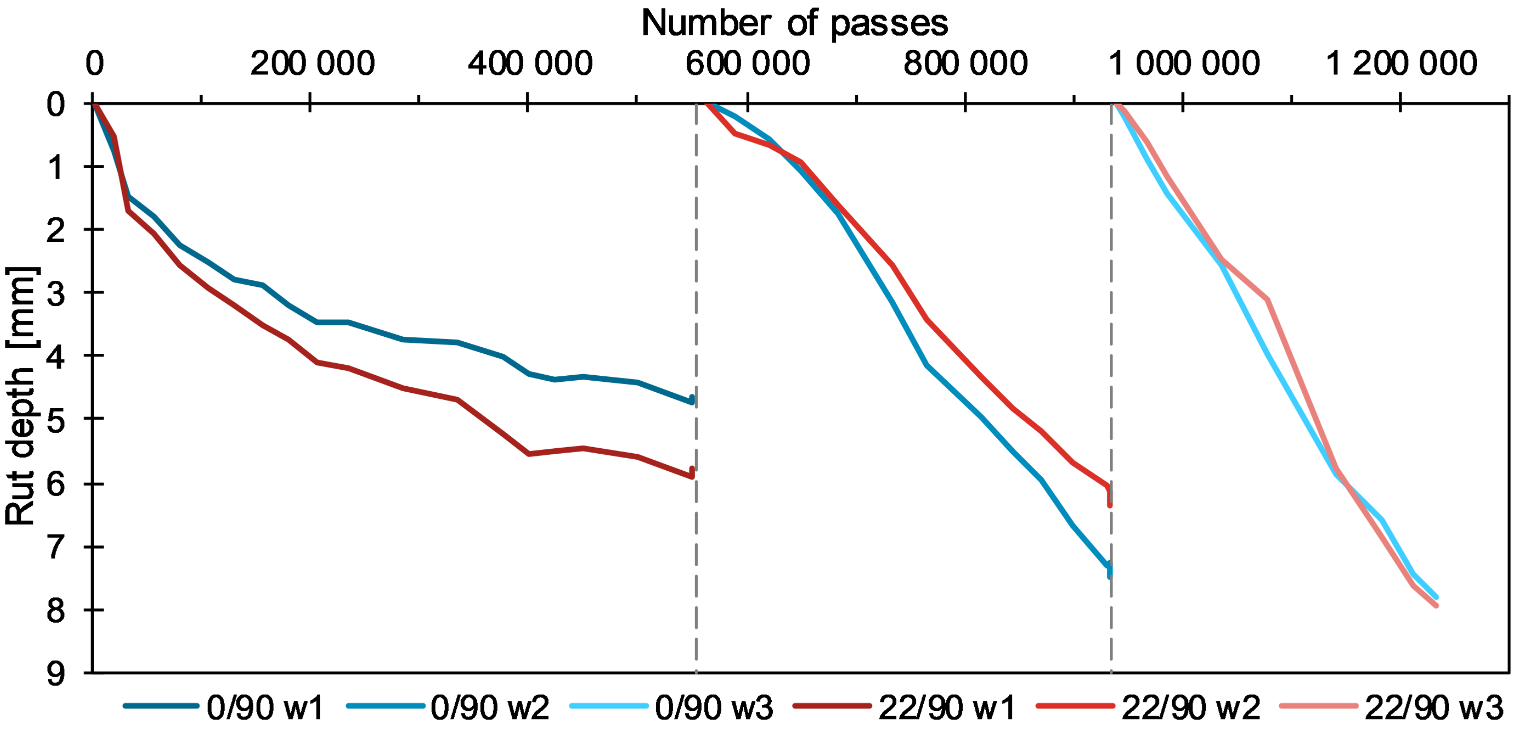
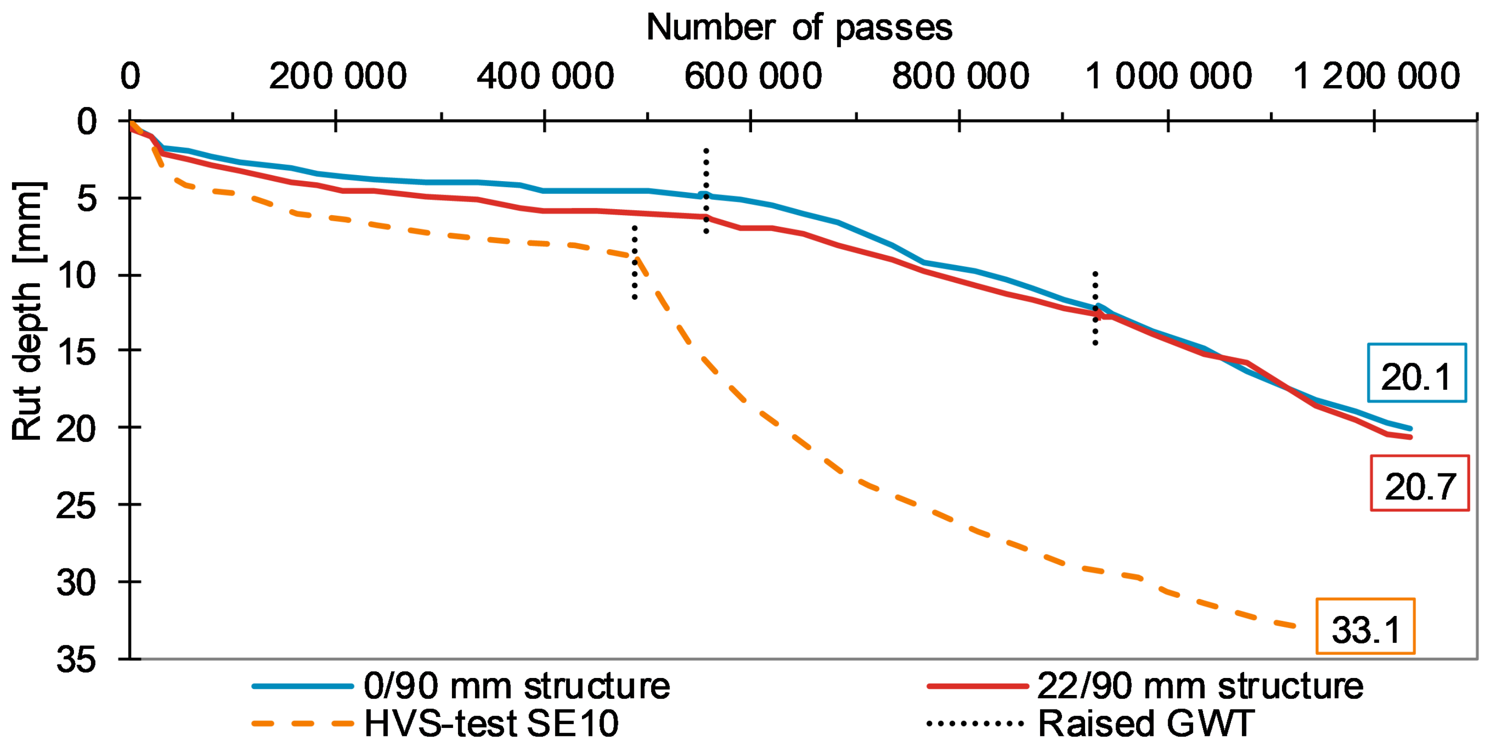
Rut development



Rut depth adjusted to zero when GWT is raised

Rut depth calculated as average from three laser profiles, error bars showing max/min

Comparison to previous HVS test



Accelerated traffic

- 1.23 million load repetitions from a 12 t axle corresponds to ~2.5 million 10 t standard axles
- Distributed over 20 years, this would mean an average daily traffic of ~3000

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Findings:

- Traffic corresponding to AADT 3000 over 20 years resulted in a rut depth of ~20 mm
- Increasing the ground water level affects the moisture level far above the GWT
- The rutting rate increases dramatically as GWT is introduced to the upper part of the structure (w2).
- Increased GWT affects the well-graded subbase more than the open-graded
- Even though the structures respond differently to the GWT increases, both reach a maximum rut rate of about 2.7 mm per 100 000 load repetitions in phase w3.

Further work:

- Analyse falling weight deflectometer data from all GWT levels
- Analyse and model stress and strain levels
- Model permanent deformations and rut depth development