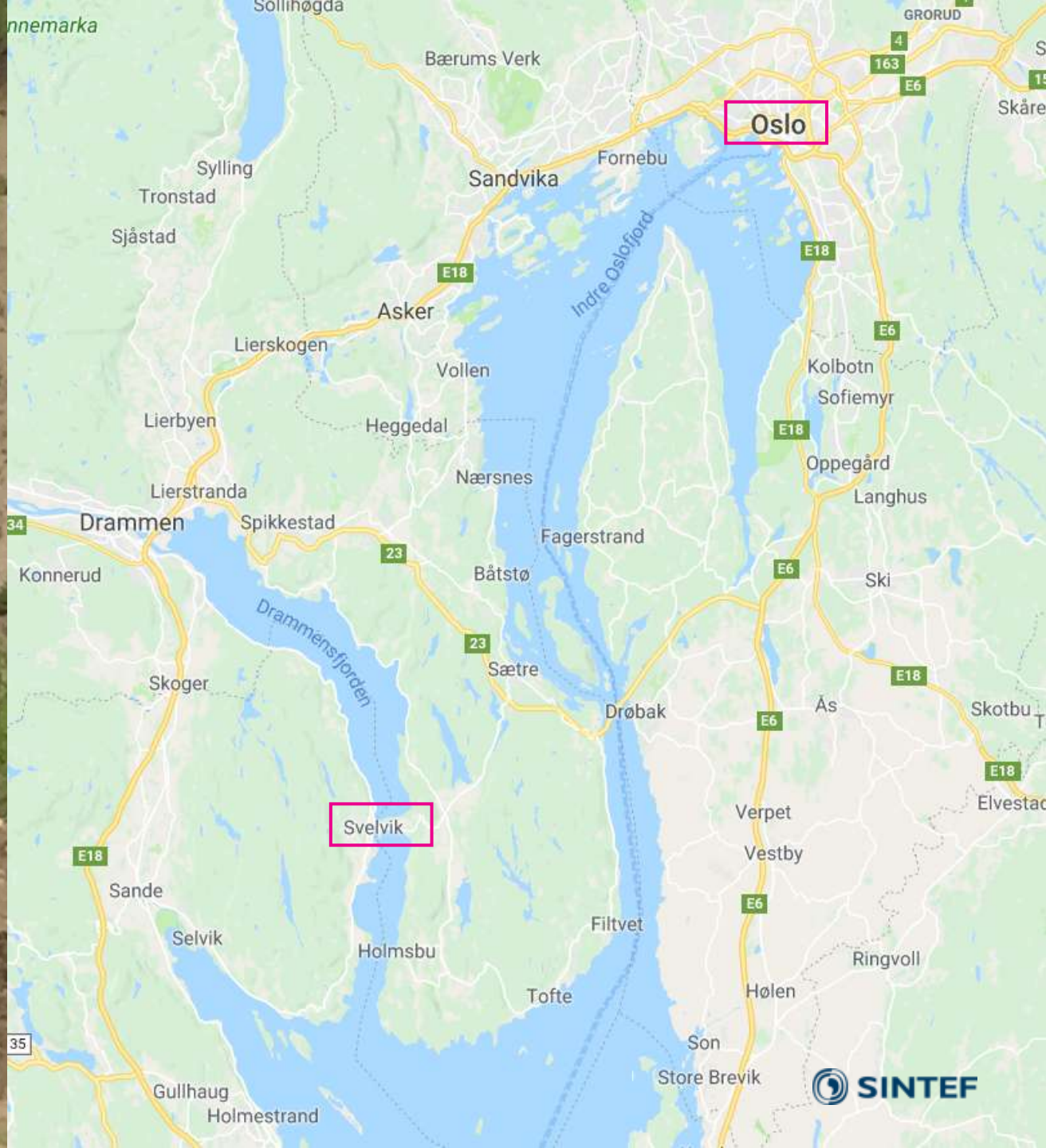


# SVELVIK CO<sub>2</sub> FIELD LAB

A small-scale laboratory for development of equipment and CO<sub>2</sub> monitoring techniques

C. Ringstad, M. Jordan, P. Eliasson, A.-A. Grimstad, K. Hagby,  
C. Schmidt-Hattenberger, W. Weinzierl, B. Wiese and A. Wüstefeld

**CO<sub>2</sub>**  
SVELVIK FIELD LAB





## RE-VITALISATION AND UPGRADE

Development and testing of technologies and equipment required for large-scale CCS applications in a rapid and cost efficient manner

## ECCSEL INFRASTRUCTURE

- European Carbon dioxide Capture and Storage Laboratory Infrastructure
- Opening access for CCS researchers to a top quality European research infrastructure
- Nine European countries



Svelvik #1



Svelvik #2

Svelvik #1

Appraisal well  
333 m deep

Svelvik #2

Pump test  
Screen at 64-65 m depth

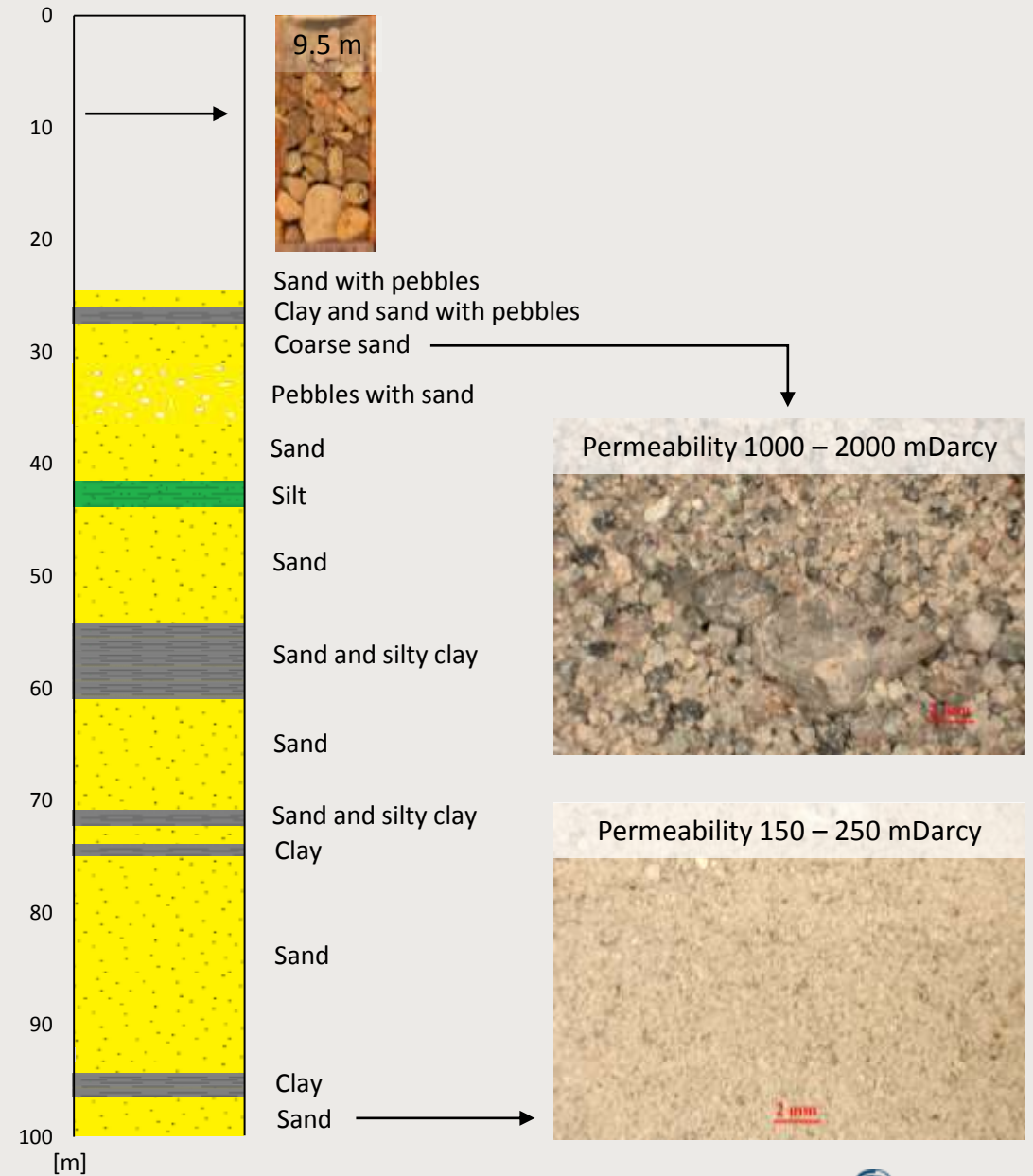
## GEOLOGICAL MODEL

Down to ~35 m

Sand and gravel deposits close to the glacier front

Below ~35 m

Alternating layers of sand, silt and clay deposition further away from the glacier front



## GEOLOGICAL MODEL

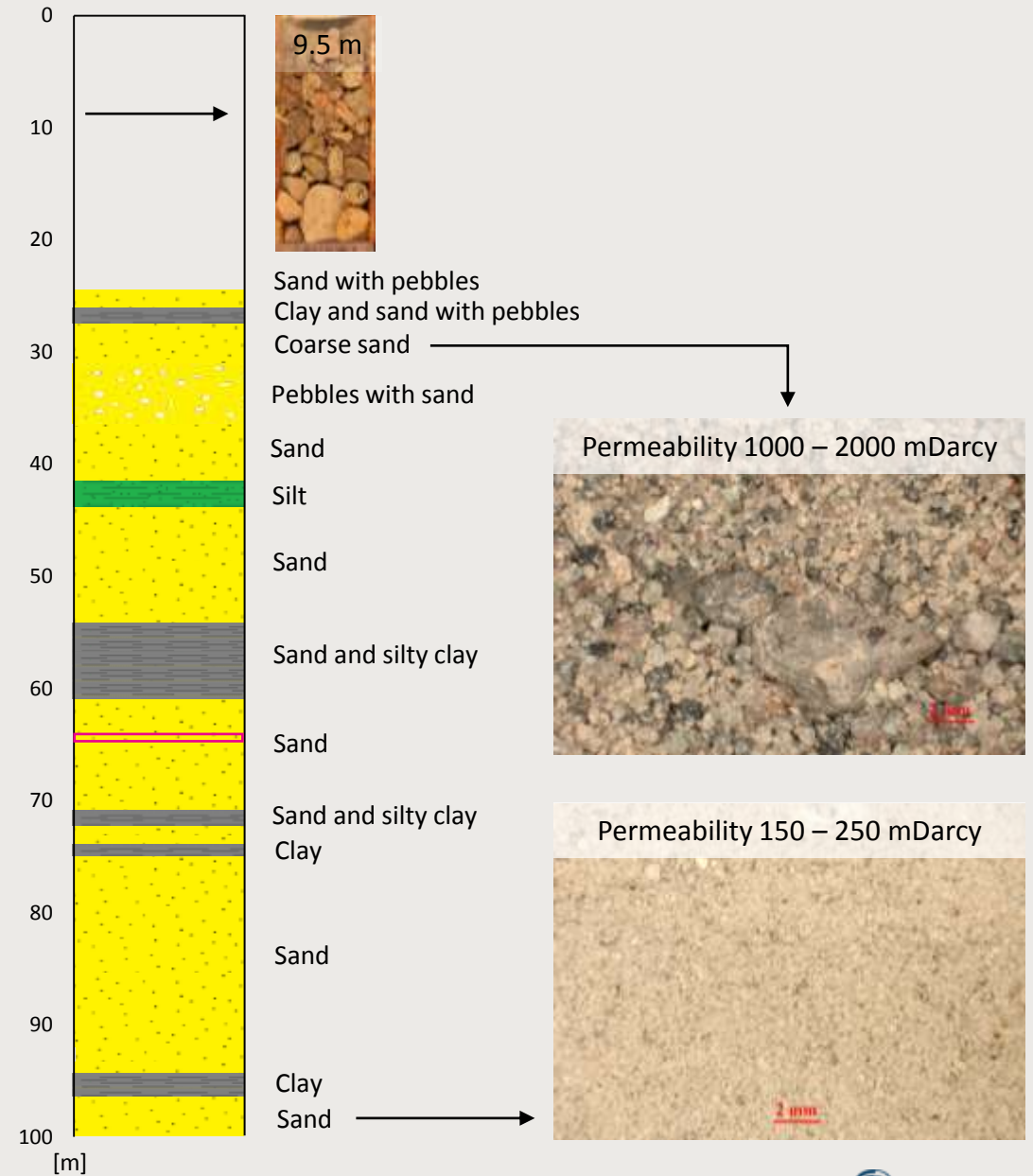
Down to ~35 m

Sand and gravel deposits close to the glacier front

Below ~35 m

Alternating layers of sand, silt and clay deposition further away from the glacier front

Injection interval = 64 – 65 m

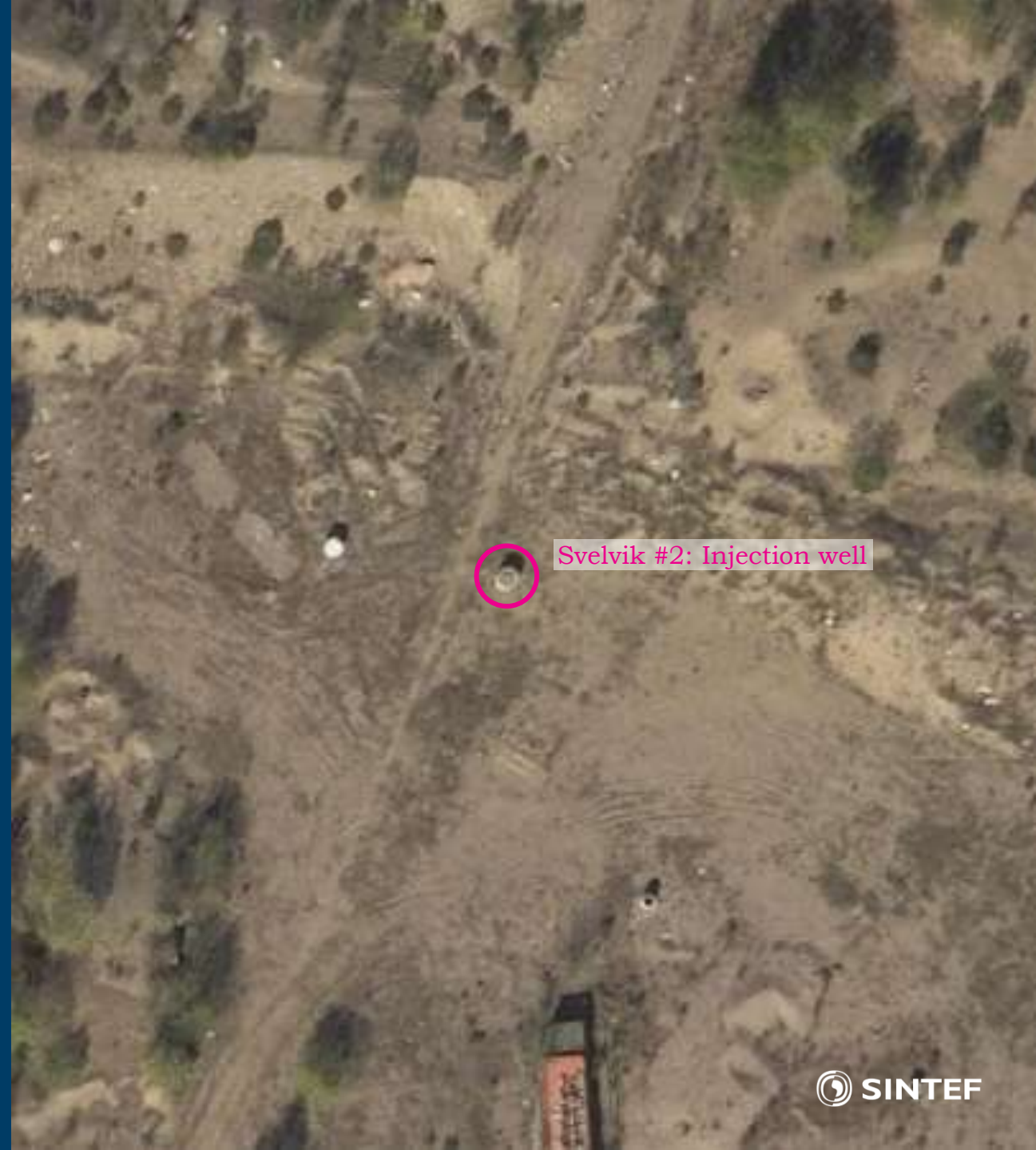




## RE-VITALISATION AND UPGRADE

### INJECTION WELL

Convert Svelvik #2 into an injection well for water and CO<sub>2</sub> injection @ 64 – 65 m



## RE-VITALISATION AND UPGRADE

### INJECTION WELL

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### MONITORING WELLS

Drilling and instrumentation of four vertical 100 m deep wells for cross-well monitoring





## MONITORING WELLS DRILLING

### 1) Auger drilling

Steel casing  $d = 355 \text{ mm}$ ,  $l = 6 \text{ m}$



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Drill bit  $d = 311 \text{ mm}$



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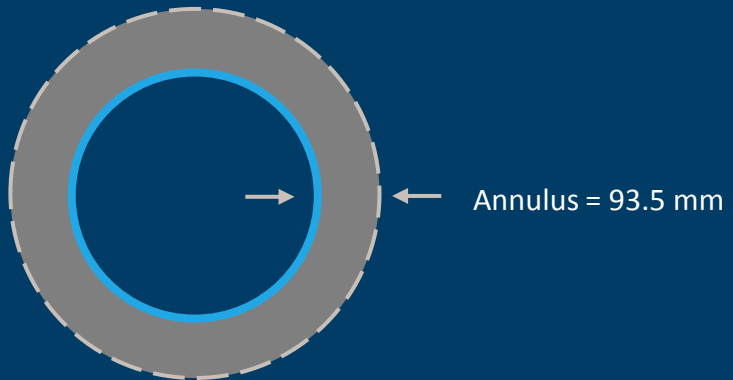




## MONITORING WELLS CASING

### PVC CASING

ID = 110 mm, OD = 125 mm, l = 5.8 m



MONITORING WELLS  
INSTRUMENTATION BEHIND CASING

- Electrical resistivity tomography (ERT)

Electrical resistivity tomography (ERT)



MONITORING WELLS  
INSTRUMENTATION BEHIND CASING

- Electrical resistivity tomography (ERT)

FIBROPTIC CABLES

- Distributed acoustic sensing (DAS)
- Distributed temperature sensing (DTS)
- Distributed strain sensing (DSS)

FIBROPTIC CABLES



Loop installation with no splicing



## MONITORING WELLS

### INSTRUMENTATION BEHIND CASING

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### FIBREOPTIC CABLES

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## FIBREOPTIC CABLES



## MONITORING WELLS INSTRUMENTATION BEHIND CASING

- Electrical resistivity tomography (ERT)

### FIBROPTIC CABLES

- Distributed acoustic sensing (DAS)
- Distributed temperature sensing (DTS)
- Distributed strain sensing (DSS)
- LBNL straight DAS and DSS
- LBNL helical DAS and DSS



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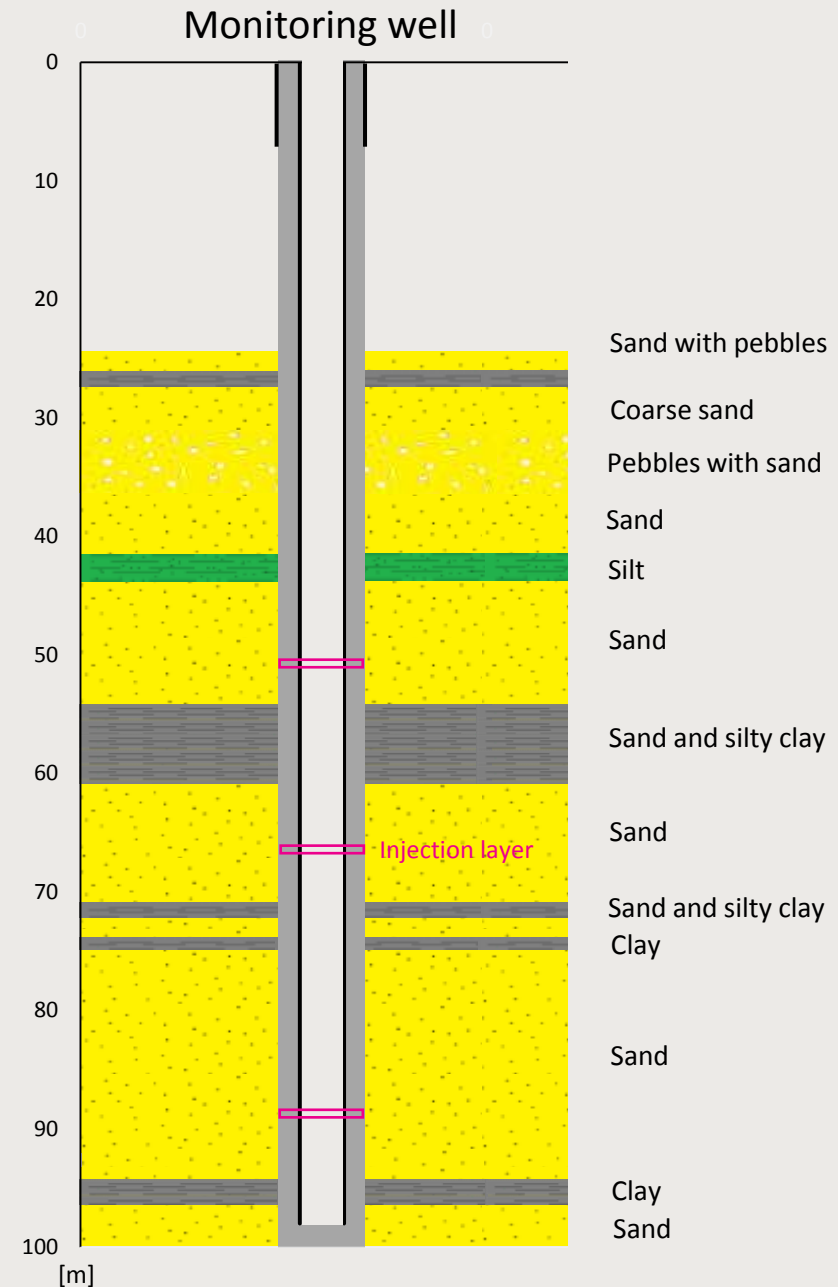
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### IN-SITU MEASUREMENTS

- Pore pressure at three depths
- Fluid sampling (injection layer)
- Gas sampling (injection layer)



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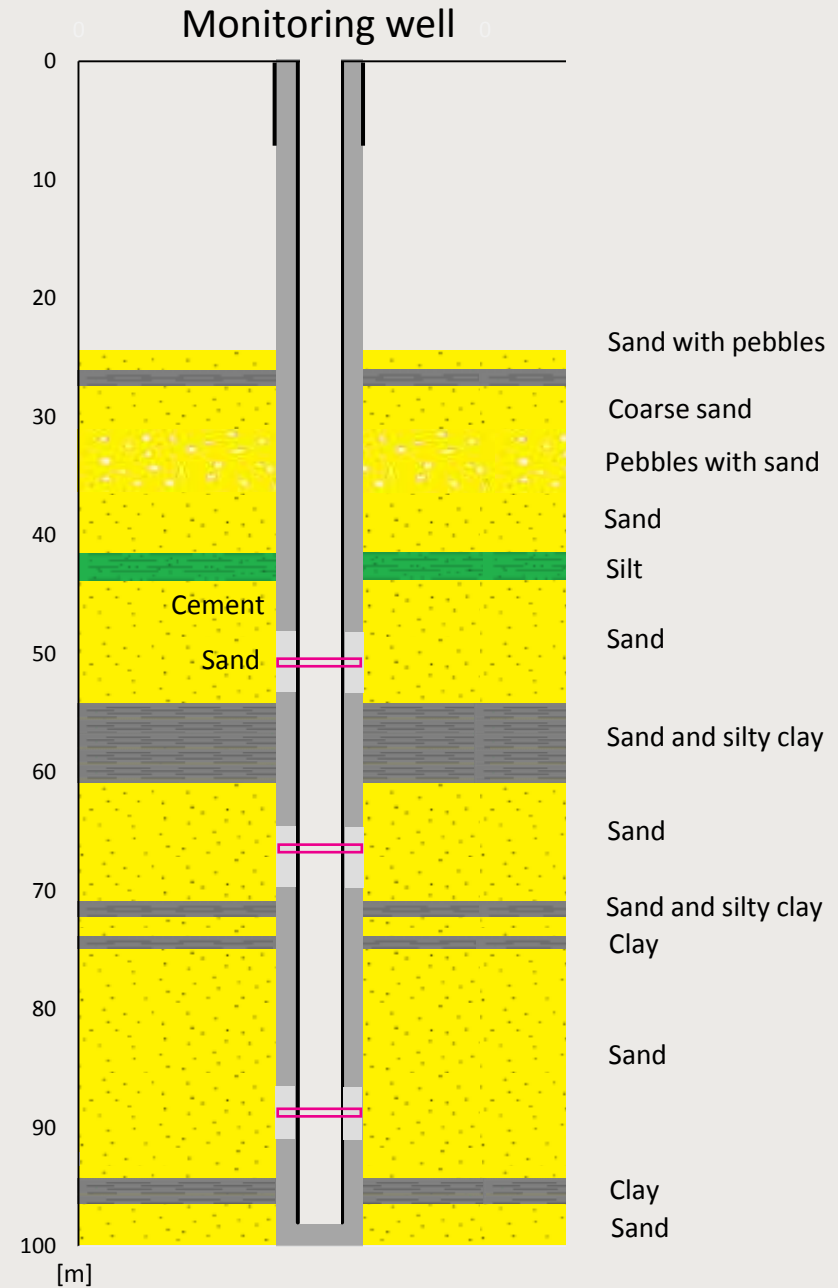
## MONITORING WELLS CEMENTATION

### 1) SAND INTERVALS

Where the pore pressure is measured

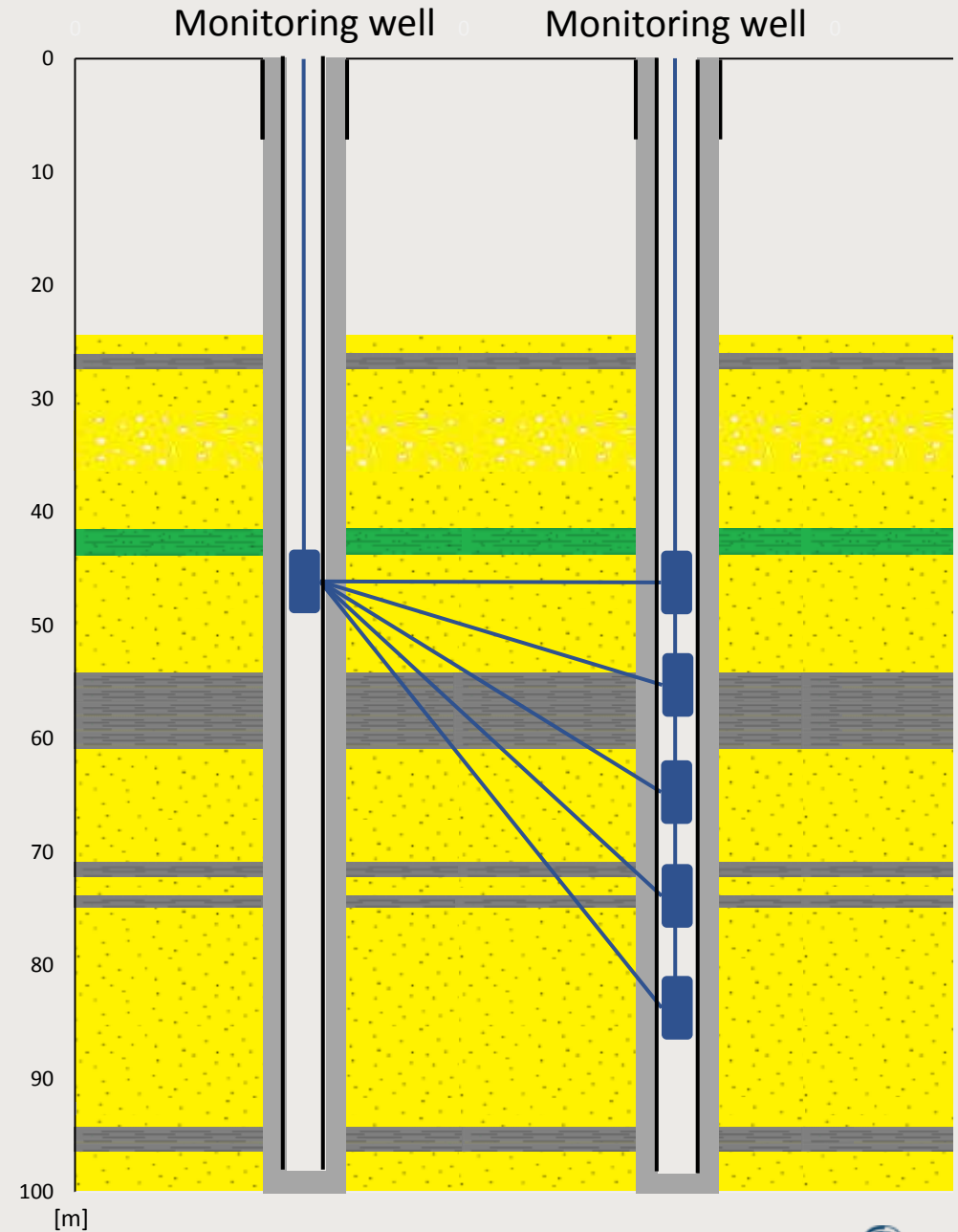
### 2) CEMENT INTERVALS

Otherwise



## MONITORING WELLS CROSS-WELL MEASUREMENTS

- 1) CONVENTIONAL  
In borehole
- 2) FIBROPTIC  
Outside casing  
In borehole





UiO : University of Oslo

**NORSAR**

**GFZ**

Helmholtz Centre  
**POTSDAM**



Brøndboringsfirmaet  
Brøker A/S



**SVELVIKSAND**



The Research Council  
of Norway

