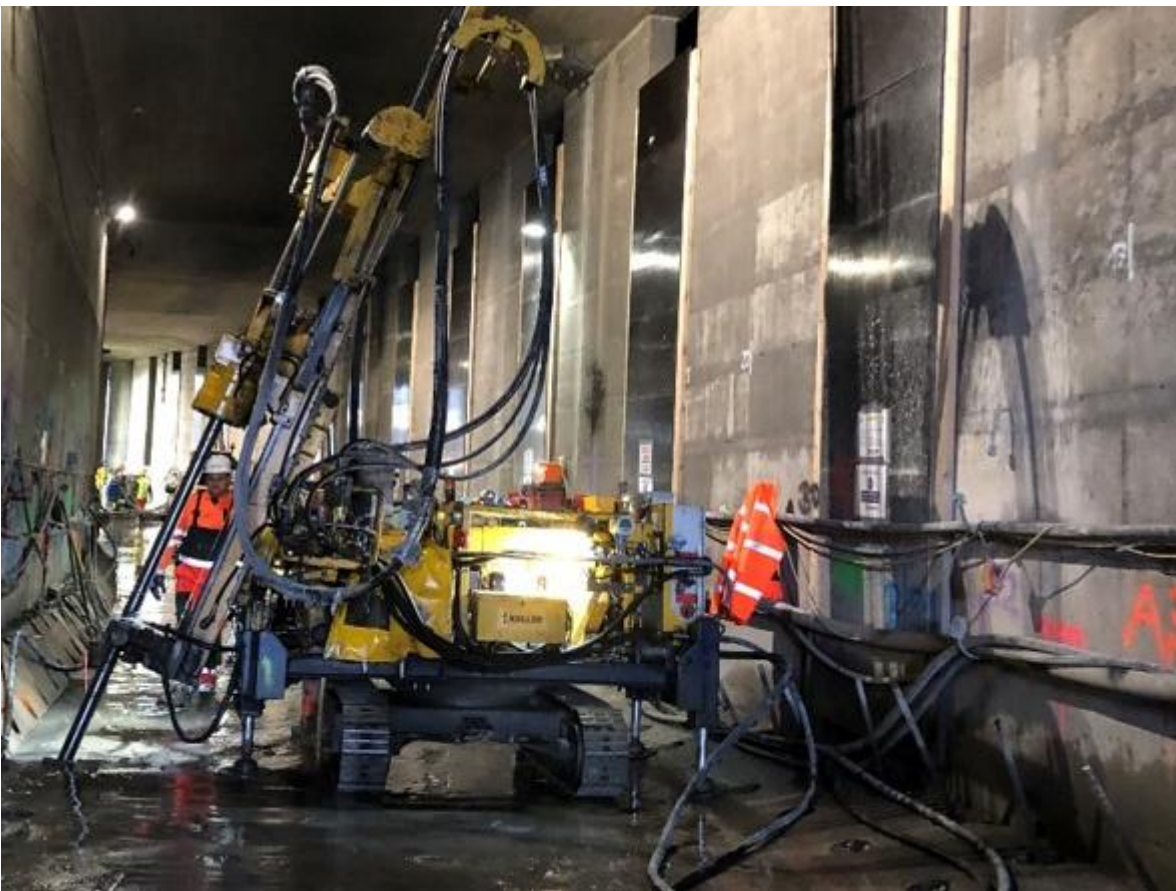


## Follo Line Railway and Railway Tunnel Jet Grouting

Oslo, Norway

The Follo Line project is currently the largest infrastructure project in Norway. The project includes 22 km of new railway from Oslo to Ski.



### The project

The main part of the project consists of a 20 km long tunnel which will be the longest in the north when it is finished. On the project, Keller has mainly performed Dry soil mixing, Steel core piles, Jet grouting and Rock grouting in rock in Oslo S.

## The challenge

At the workplace there were many different technologies and nationalities, so logistics and planning were important. In some parts the clay was soft and quick, but in other parts the clay was medium stiff and low to medium sensitivity. Above the clay there was a layer of dry crust and fill that mostly varied between 1 and 5m in thickness. Beneath the clay there was a moraine layer with a thickness that varied between 1 and 20m. The moraine layer was thickest in areas with the largest depth to rock. Due to old foundations and archaeological findings the soil stabilisation works done by Dry soil mixing was replaced with Jet grouting alongside the Sheet piles and in specific areas for underpinning existing tunnels.

## The solution

Keller installed 1000 pieces (17,600m) of Ø800mm and more than 5000 pieces (67,500m) of Ø1200 mm jet grouted columns using the single jet system with variable parameters to reach the design diameter up to 22m deep, working day and night shifts next to active railway lines in order to deliver on time. Special filter presses were installed for treating the backflow, minimising the environmental footprint. The work was accompanied by real time monitoring of deformations by hydraulic load cells.

## Project facts

### Owner(s)

Bane NOR

### Keller business unit(s)

Keller Grundläggning AB  
Keller Grundbau

### Main contractor(s)

Bane NOR  
Project Manager Anne Marie Syvertsen  
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### Solutions

Excavation support  
Underpinning

### Markets

Infrastructure

### Techniques

Jet grouting

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