

Norhard

NORWEGIAN HARD ROCK DRILLING

USING DISRUPTIVE DRILLING TECHNOLOGY TO SUPPLY UNIQUE VALUE FOR CUSTOMERS

- ✓ **COST EFFICIENT**
- ✓ **ENVIRONMENTALLY FREINDLY**
- ✓ **FULL PROFILE DIRECTIONAL DRILLING**

KEY FEATURES:

- Bottom to top drilling
- High trajectory precision
- Patented technology
- Full service drilling and lining solutions for onshore tunnels
- Modular rig for helicopter transport
- Electrically driven equipment
- Own production of critical components
- Remote operated navigation, steering and control
- Non-rotary drill string reduces friction and energy consumption



Archive photo of surface penetration - Bjåstad

ENVIRONMENTAL BENEFITS:

• CUTS CO₂ EMISSIONS –

- ✓ No explosives, avoiding the emission of 140 tons of CO₂ per average project and eliminating hazardous activities related to blasting works
- ✓ No need to build access roads, avoiding emissions of 0,4 tons of CO₂ emissions per meter

• BOTTOM UP DRILLING

- ✓ Enables drilling in locations otherwise unfeasible due to technical or environmental challenges

• HSE

- ✓ improved working environment for operators
- ✓ Efficient & fully electrically powered drilling motor, noiseless and with no ground vibrations
- ✓ HSE improvement (no toxicity problems), no photochemical oxidant formation, particulate matter formation, and acidification of soil.



Archive photo of the completed Vågååna powerstation.



Archive photo of equipment transport - Kjerringnes

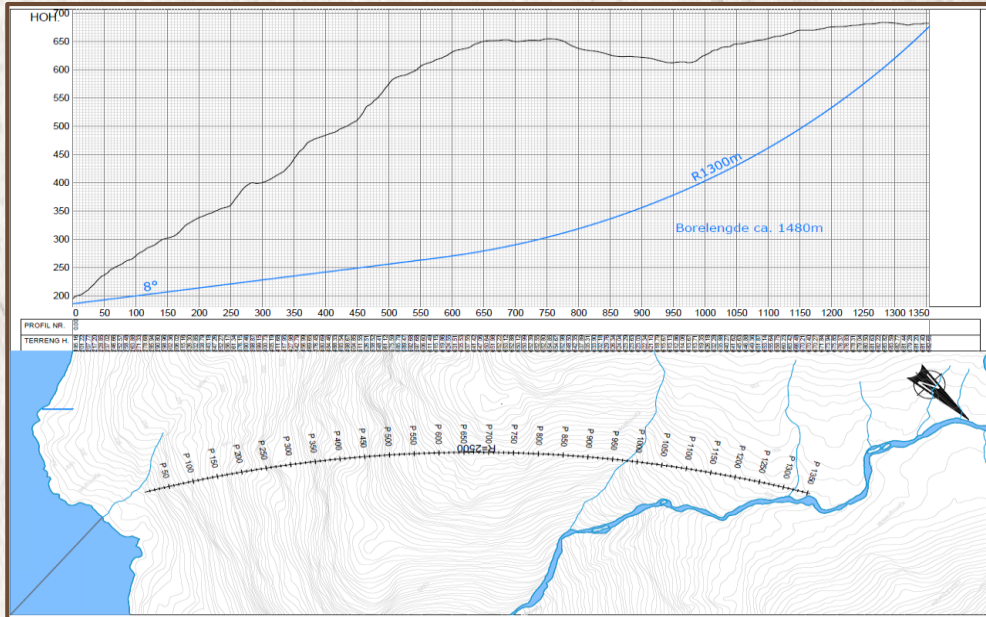
HIGH PRECISION DRILLING

• HIGH TRAJECTORY PRECISION AND AUTOMATION LEVEL

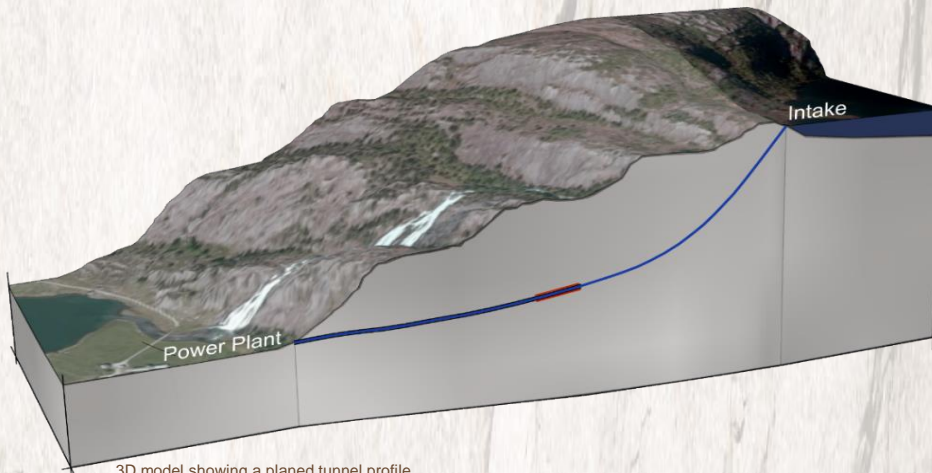
- ✓ Built-in state-of-the-art navigation system, allowing to follow any pre-defined drilling trajectory (straight or curved) with the highest accuracy
- ✓ Accuracy: 1 m per 1000 m drilled distance
- ✓ Drilling over differences in elevation of 1000m

• LENGTHS – Up to 2-3 km

• DIAMETERS – From 380 mm up to 1500 mm



Predefined drilling curves showing upward curve and swing.



3D model showing a planned tunnel profile.

PREVIOUS CUSTOMERS

Norhard are proud to have delivered drilling services to several sectors, including:

Hydro power plants

Fish farms

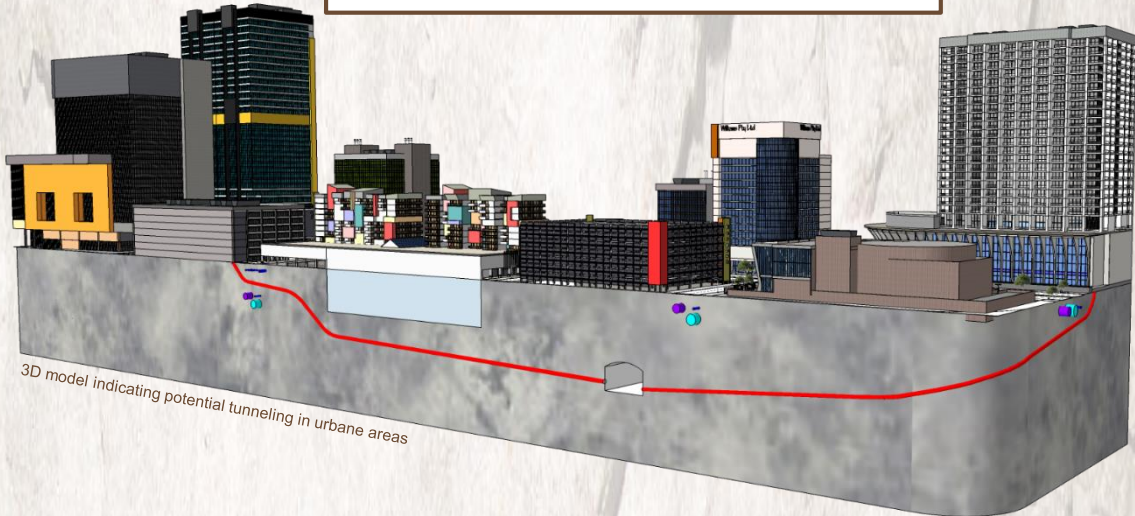
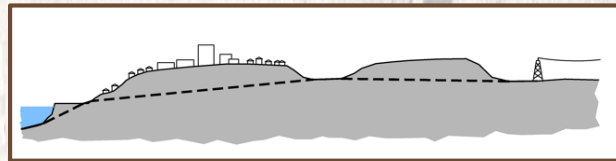
Municipal water supply



TAKING THINGS UNDERGROUND:

With growing focus on environmental and esthetic issues tunneling is a natural solution

- **Supply systems** for gas, water, district heating, power and telecommunications
- **Disposal systems** for waste, sewage and drainage
- **Relocation** of overhead lines to underground



3D model indicating potential tunneling in urbane areas



Norhard are proud to have received funding by the Horizon 2020 programme of the European Union.