



## Seawater Dispersion Study, Sture Norsk Hydro, Norway

This study aimed at the determination of the influence of an increase of the discharge of a warm water outlet on the ambient seawater temperature. The outfall is located at the bottom of a fjord. A buoyant jet develops as the warm water is rising.

Two approaches have been followed. First, an analytical approach was followed for determination of the dilution of the warm water with still ambient water. Second, the fully three-dimensional numerical flow and temperature model FINEL3D was applied. Still water was considered as well as ambient flow.

The figure shows the bathymetry (brown) and the contour for the temperature excess of 0.2 °C (red). This contour visualises the path and the spreading of the buoyant jet. The characteristics for such buoyant jets were properly simulated: the initial horizontal flow direction, the rising due to buoyancy, the bending by the ambient flow, the splitting at the surface and the spreading on the water surface.

It was concluded, based on the analytical and numerical modelling, that the increase in discharge did not result in a significant increase of the seawater temperature. The criterion of a maximum temperature excess of 1 °C at 100m from the outfall was met.

**Client**  
Norsk Hydro, Norway

**Location**  
Sture, Norway

**Date**  
2005 (study)

**Services**  
analytical modelling  
three-dimensional flow and  
temperature simulation for near  
field and far field