



## TAILINGS DISPOSAL OFF THE CONTINENTAL SHELF

Carefully planned submarine disposal of tailings in very deep waters can offer significant environmental benefits when compared to traditional tailing management techniques. However, planning must take into account the dispersion and physical processes, as well as the biogeochemistry.

Mine tailings are discharged as a slurry off the coast at depths of over 500m on the edge of the continental shelf. The tailings diffuser on the seabed will produce a mound of tailing mud that will then slide down the shelf edge under its own weight due to gravity and ocean currents. Depending on the slope of the seabed, the tailings can slide to depths of several thousand meters, where there is a lower risk of environmental harm compared with land based storage. In some cases, the tailings can remain stable and isolated from contact with the coastal environment. The large volumes of contact water within the deep ocean environment can provide significant dilution of dissolved or fine suspended material that shears off from the tailing slide. The key to obtaining acceptance is to demonstrate that the dilution is sufficiently large for the concentrations of any resulting plumes to have small environmental risks.

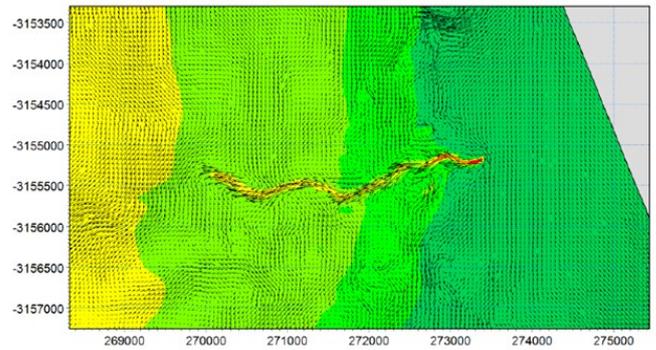
Many submarine tailing disposal schemes around the world have been poorly designed and approved with discharges in shallow depths close to coastal environments. Inadequate knowledge of the oceanic environment, hydrodynamics, plume behavior and marine ecology has resulted in significant environmental damage. In some cases, the mines have had to close due to the loss of confidence from the stakeholders. It is critical that comprehensive scientific studies are carried out to properly understand the risks associated with DSTP.

## MIKE 3 HYDRODYNAMIC AND MORPHOLOGICAL MODELLING

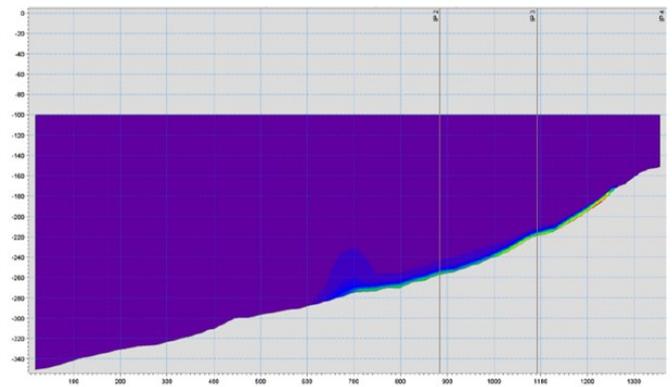
We provide modelling services for the surrounding ocean conditions and physical processes responsible for the tailings dispersion and deposition. MIKE 3 is a widely used modelling system for simulating 3D flows in ocean environments. By coupling a detailed 3D ocean model of the continental shelf with a sediment dispersion and morphological model of the tailings deposits, we can investigate the potential dilution and dispersion of the tailing disposal options.

Using the numerical models, we can evaluate:

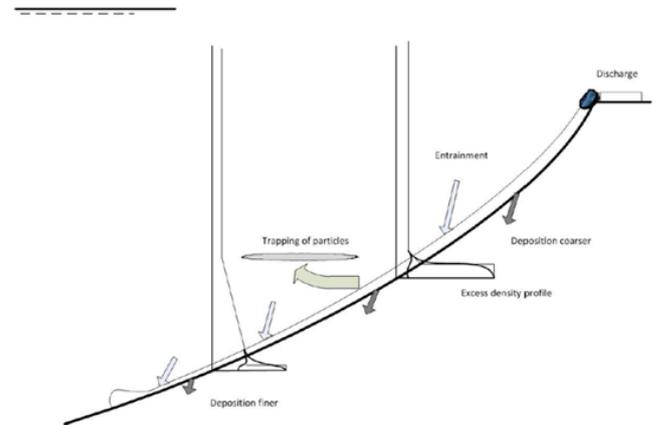
- the impact of marine disposal
- the impact of leakage from confined disposal sites
- the accumulation of tailings solids on the seabed over long time periods of up to 50 years
- the spreading of tailing material lost in suspension into the open sea with emphasis on the biologically active water layers



Current pattern in the bottom layer for southwest flowing ambient currents



Decreasing sediment concentration as the plume descends off the continental shelf



Principle behaviour of the discharge plume during descent

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