

## Simulator for marine operations



HYDRO



**Of our offshore platforms,  
this one is our pride and joy.**



# Sub sea work

## Challenge: Making the Invisible Visible

- Simulator technology enables us to:
    - Change work processes.
    - Push the limits.
    - Test a range of scenarios.
    - Reduce risk of failure.
    - Learn by “virtual” failure.
- => Cost effective operations.

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Ormen Lange





# Background

- The season 2001 Hydro replaced flexible risers on two FPU's, an operation considered challenging.
- Damages were in some cases inflicted on the adjacent risers.
- The development of a simulator for familiarization and training of operational personnel prior to and as decision support during this type of complex marine operations was initiated.
- The first version of the tool was in operative use within a year, and was utilised by Hydro for visualization and quality assurance of contractors analysis' and for familiarization of contractors personnel during replacement of flexible risers at the Njord FPU.



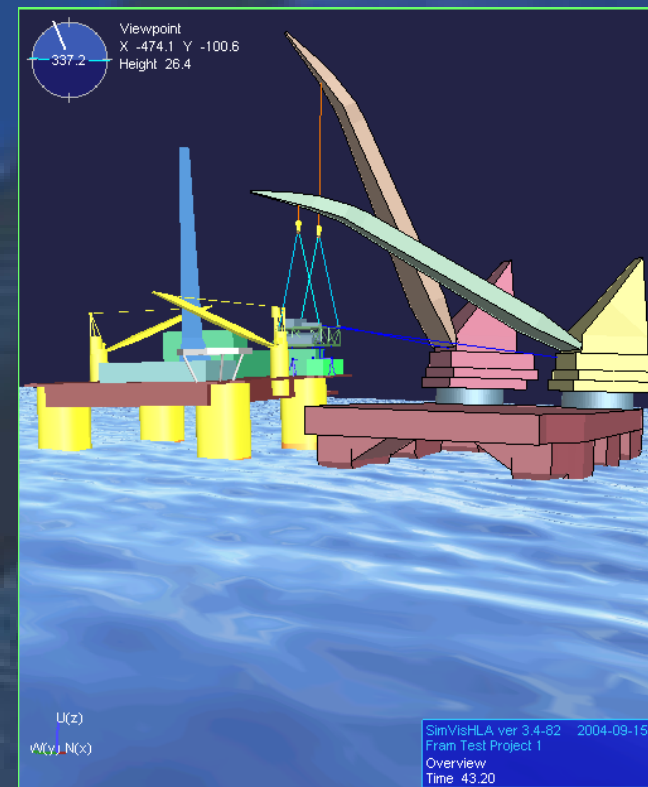
Nom. distance between risers 7m  
at 230 m water depth

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## Development of simulator

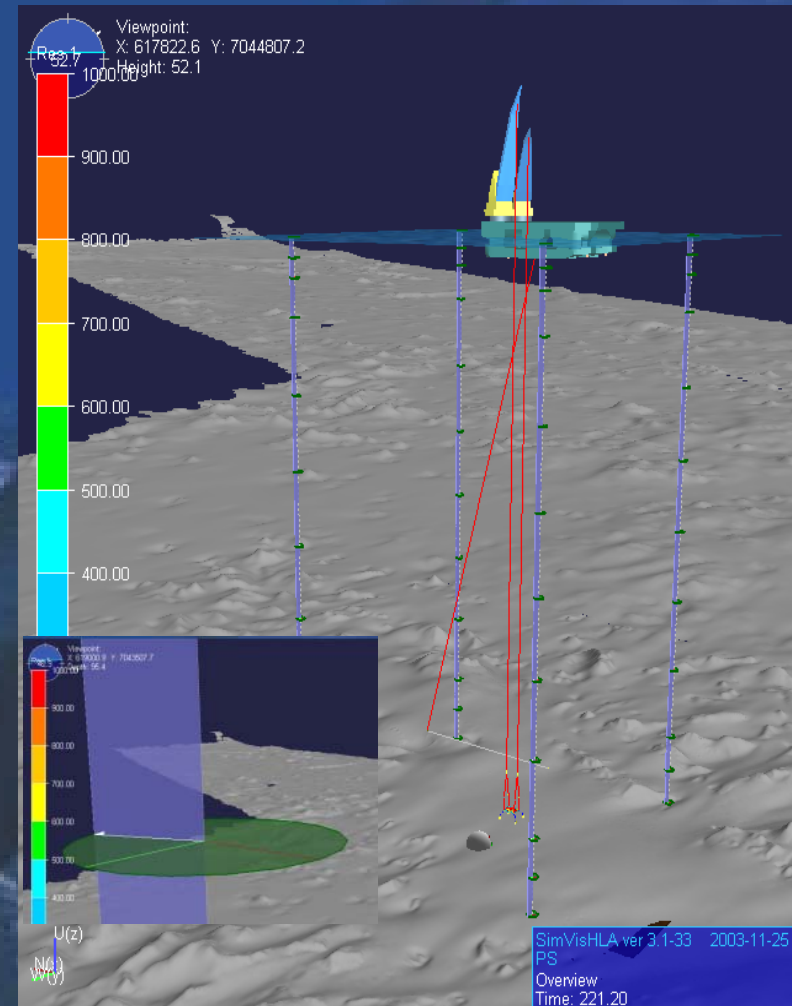
- The core in the simulator is “state of art” programs for calculation the dynamic response of vessel, risers and wires combined with advanced visualisation programs.
- JIP project :
  - Hydro
  - Marintek
  - Ceetron
  - SIM
- The simulator has been in continuous development since the first version was launched in 2002.





# Some simulator features as per today...

- **Pipe laying**
  - Irregular seabed topography combined with large water depths and strong currents.
- **Lifting operations**
  - Dynamics of vessel(s) and suspended load(s)
- **Installation of flexible risers**
  - Installation of risers in narrow corridors
- **Seabed intervention**

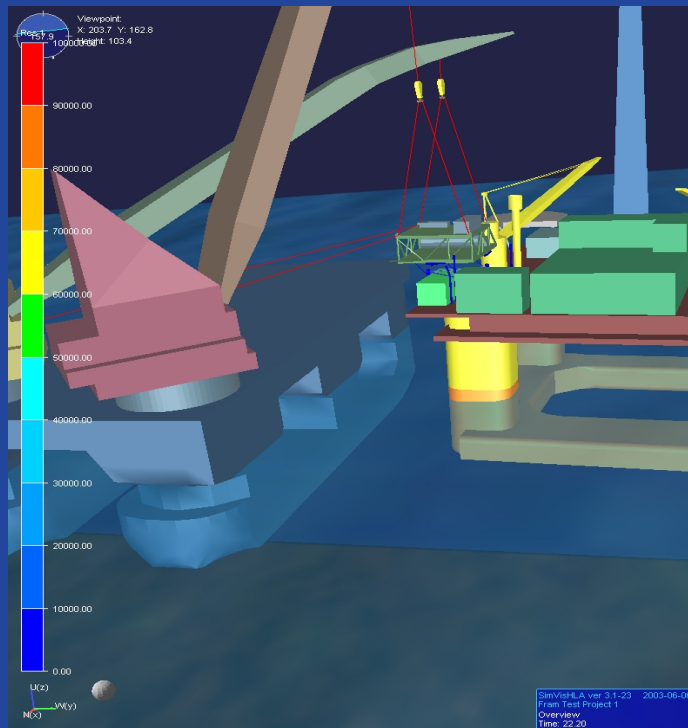


# Reference list

Riser replacement summer 2002, Njord

Riser replacement summer 2003, Visund

The 900 tons Fram West module was lifted onboard Troll C in May 2003



# Reference list, Ormen Lange

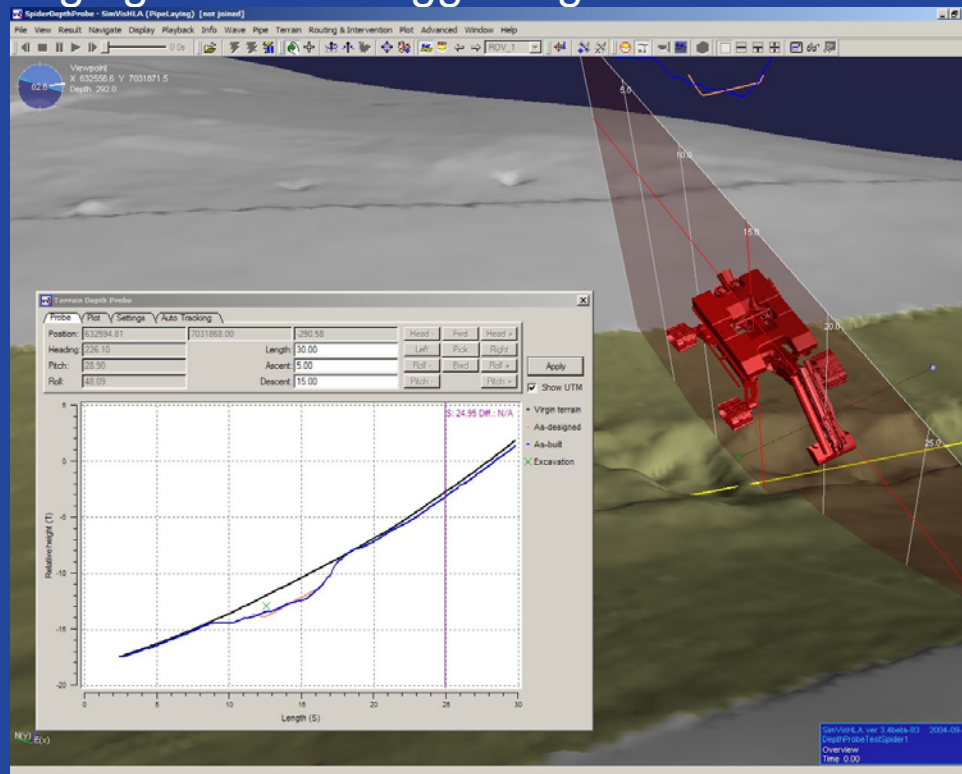
Installation of 1150 tonnes Template

Alternative installation methods for large spools

Laying in Bjørnsundet on 71 supports, Evaluation of curve stability

Rock installation in Bjørnsundet – QC and decision support

Dredging at the Storegga ridge – QC and decision support



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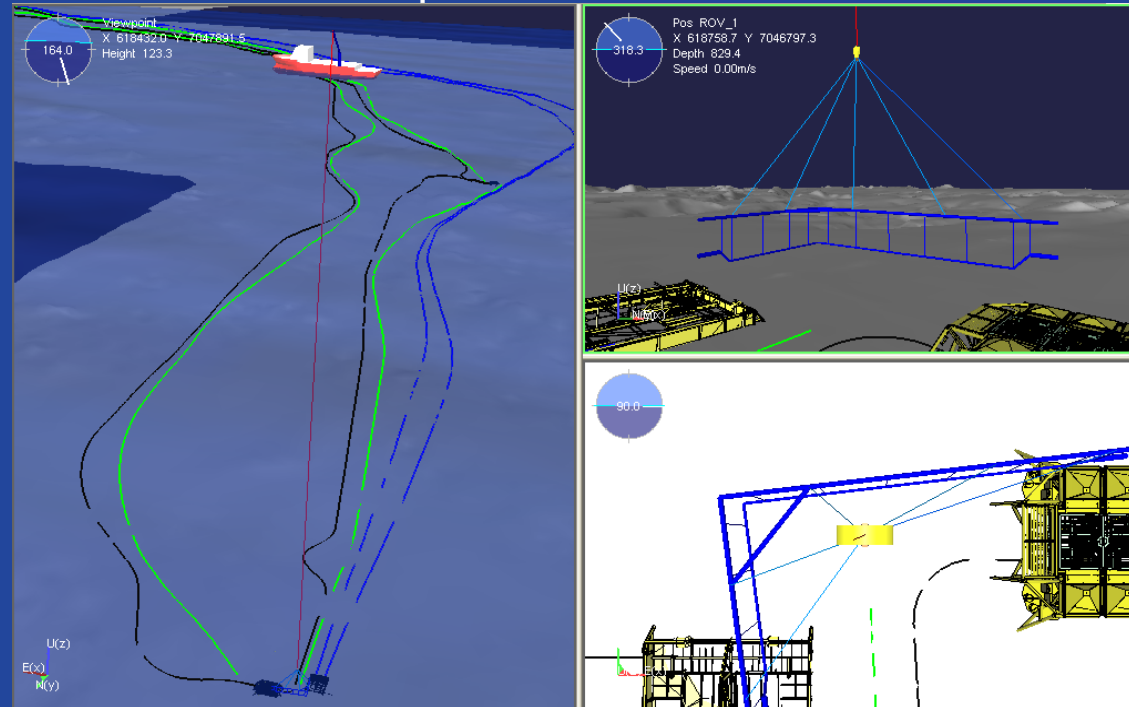


# Reference list, Ormen Lange

Installation of PLET structure

Installation of 30 inch pipeline in PLET structure

Installation of 16 inch spool

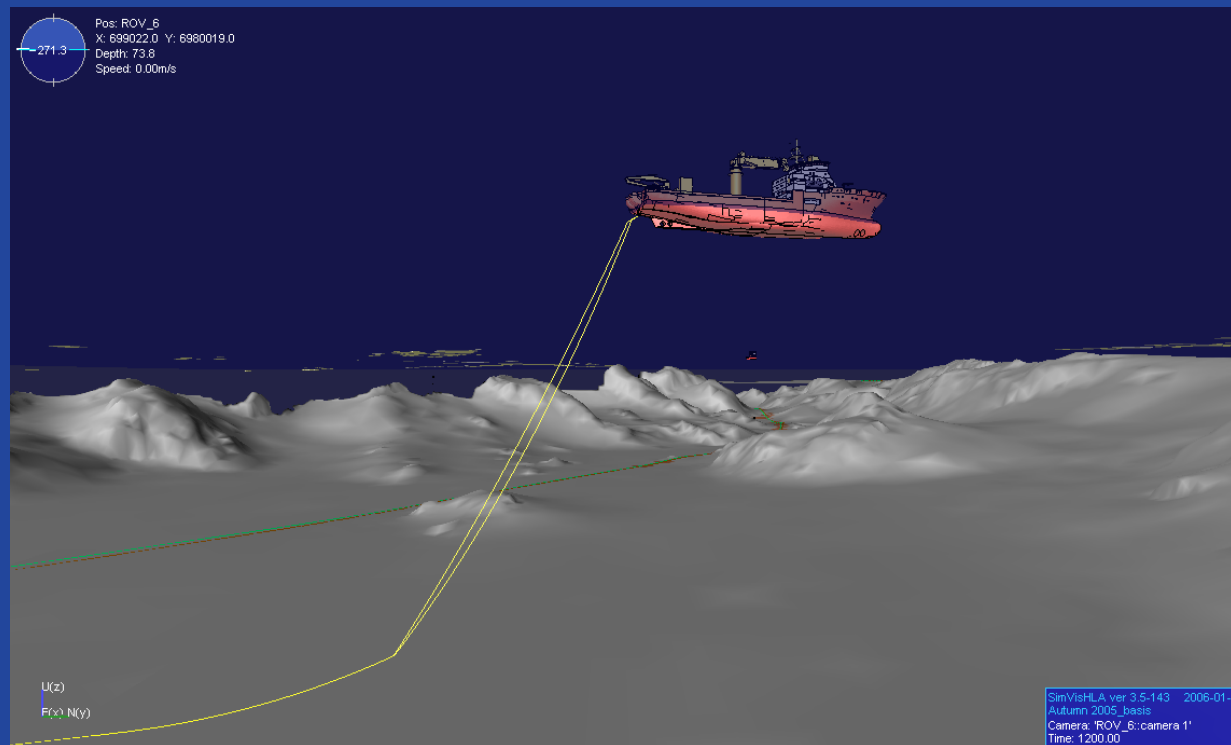


# Reference list, Ormen Lange

MEG line installation

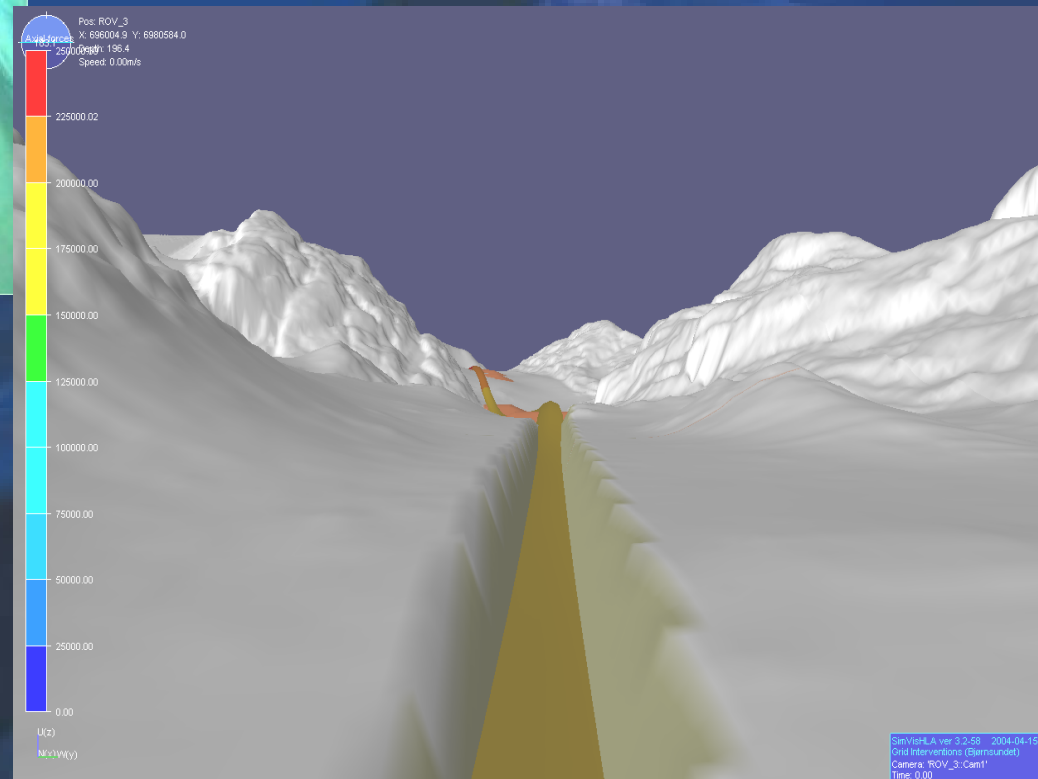
MEG pipeline down the slide edge

ISU installation



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# Virtual vs real view from ROV camera

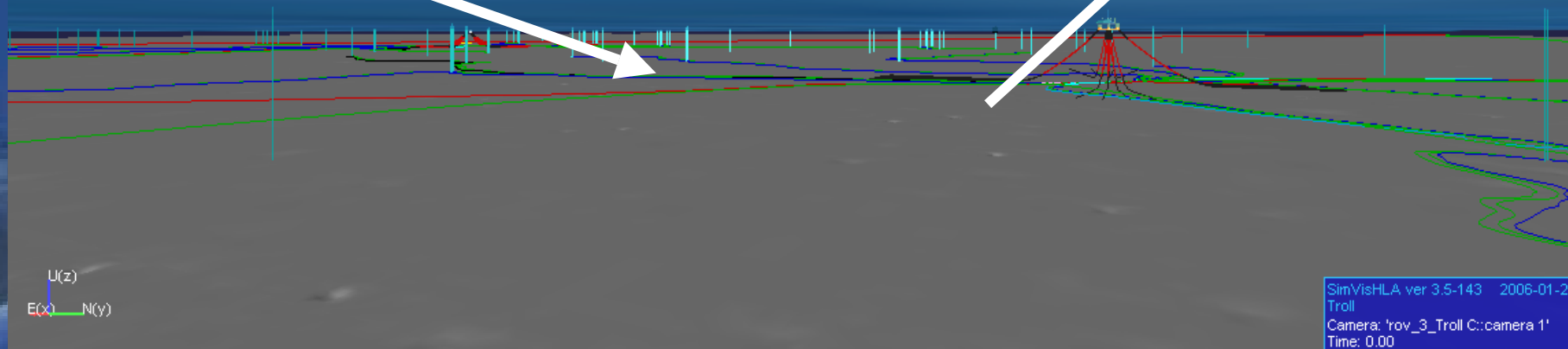


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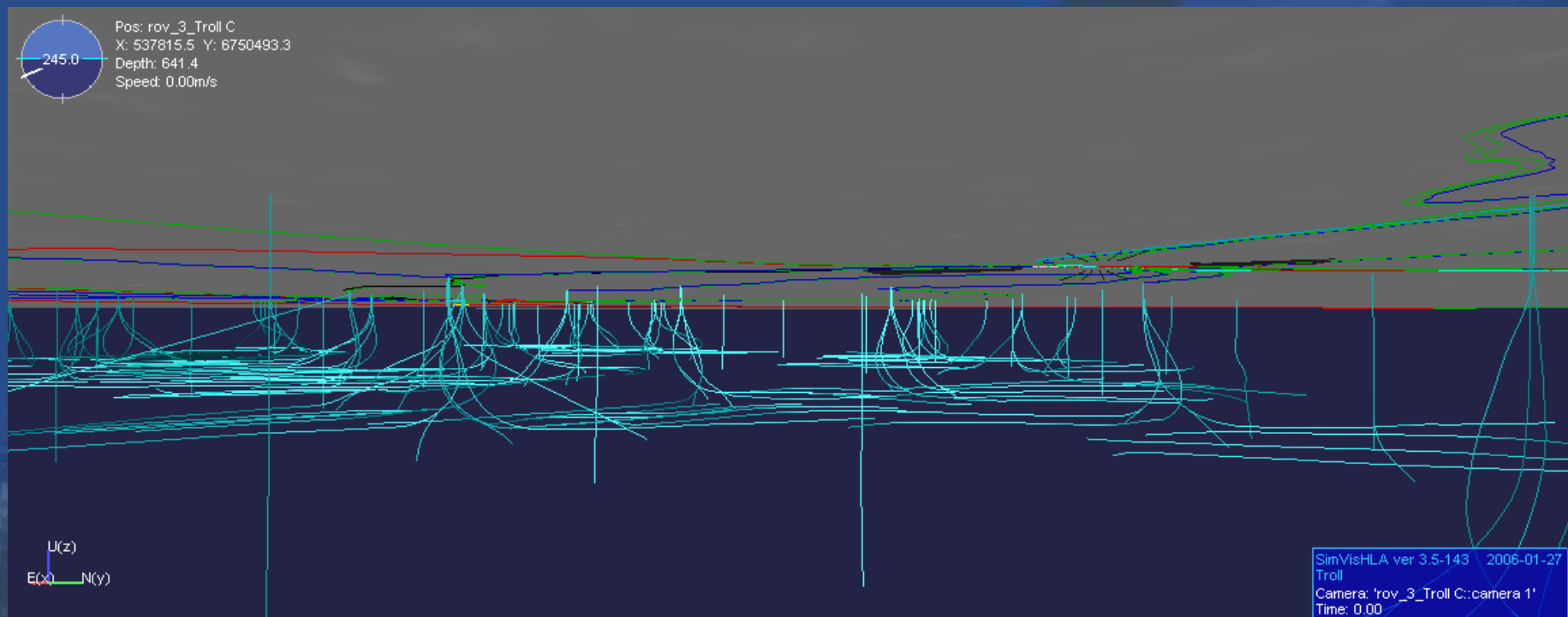
# Remote inspection tool



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# Data base well information



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