Experiences with simple and repetitive offshore foundations

by

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LICengineering A/S

OUTLINE OF PRESENTATION

Question:

- To which degree can standardisation of offshore wind turbine foundations be achieved?

When the following is considered

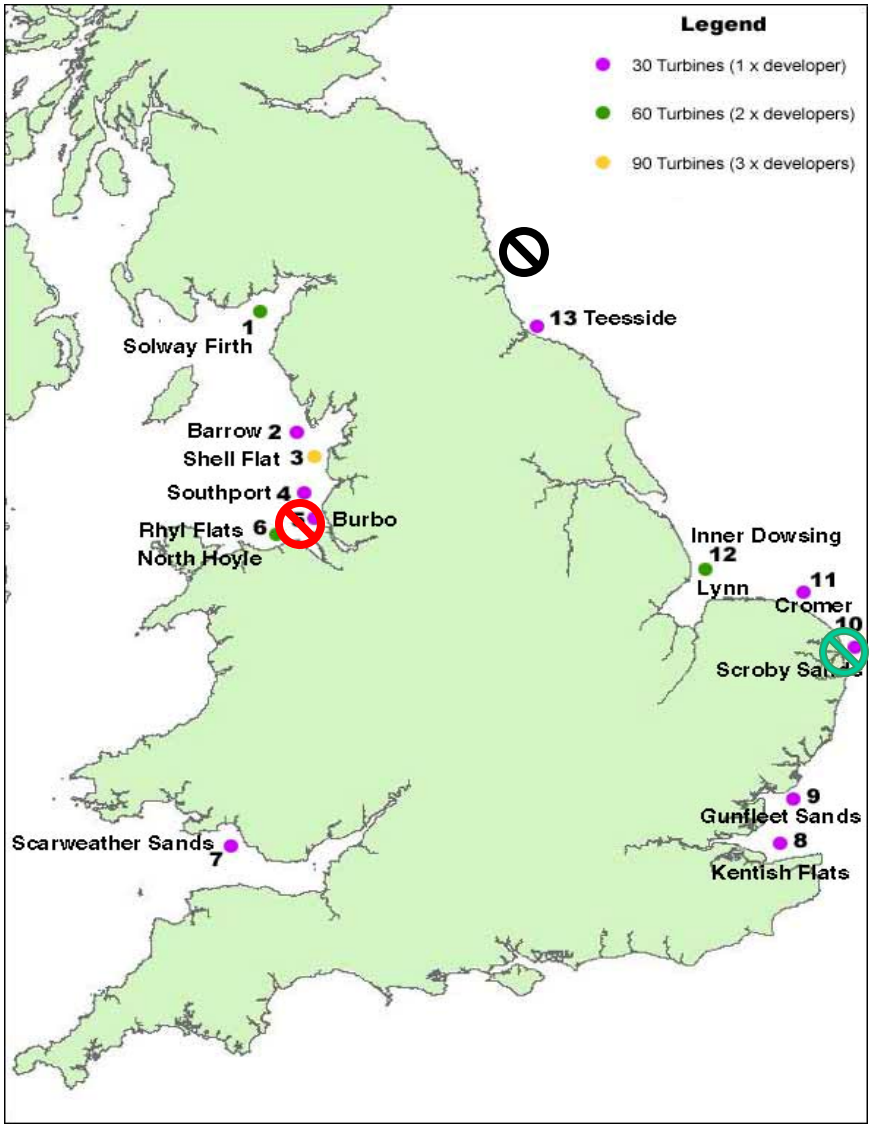
- The effect of the foundation soil/rock
- The effect of water depths
- Economics

EXAMPLES OF STANDARDISATION

- NORTH HOYLE WIND FARM
  30 VESTAS V80 TURBINES. IRISH SEA
  NORTH OF WALES, UK
- SCROBY SANDS WIND FARM
  30 VESTAS V80 TURBINES. NORTH SEA
  EAST OF NORFOLK, UK

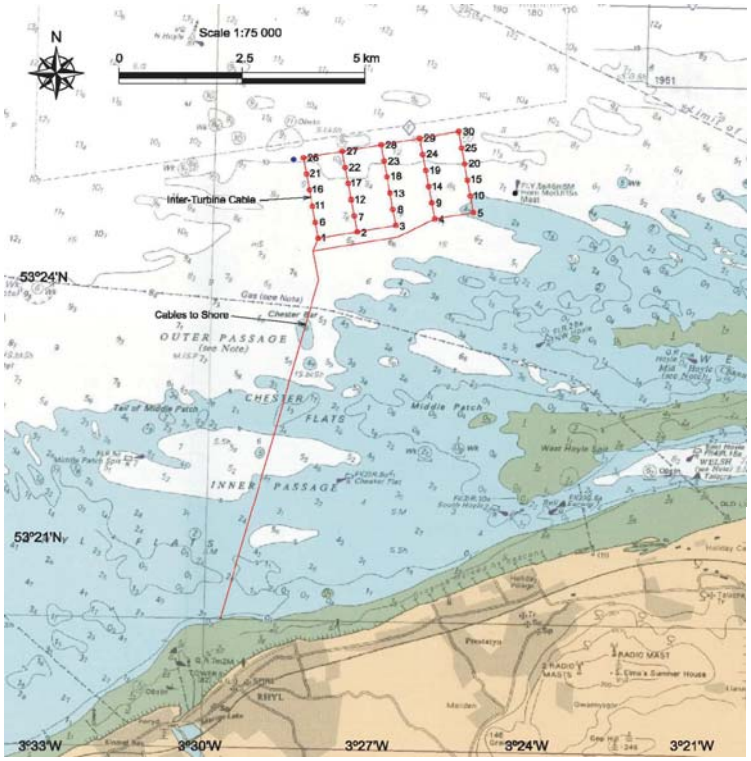
FOUNDATIONS DESIGNED FOR VESTAS CELTIC BY LICengineering A/S, DENMARK.

LICENGINEERING –Wind Turbine Foundations in UK

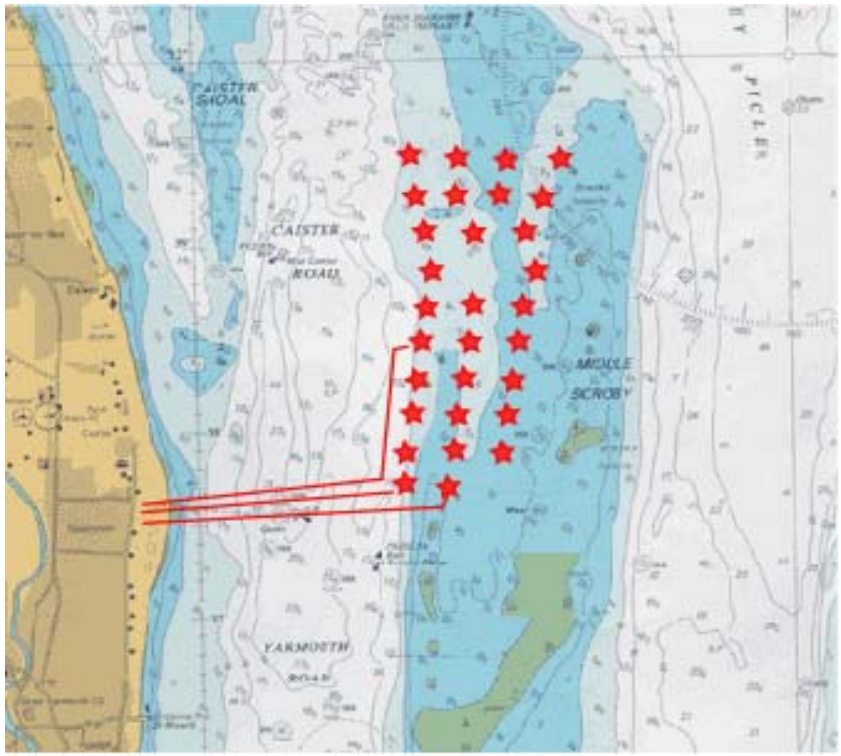


Detailed Design:

- Blyth
- North Hoyle
- Scroby Sands



a) North Hoyle



b) Scroby Sands.

STANDARDISATION OF FOUNDATIONS

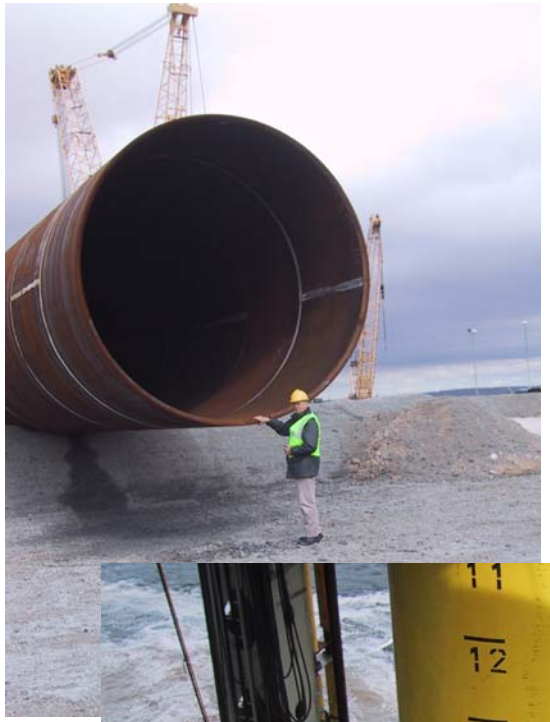
Everything above and in the splash zone can be standardised.

How will this effect main parts of foundation?

- The pile
- The transition piece (to fit tower)
- The sea acces and platform
- J-tubes for tie-in of cables
- Scour protection

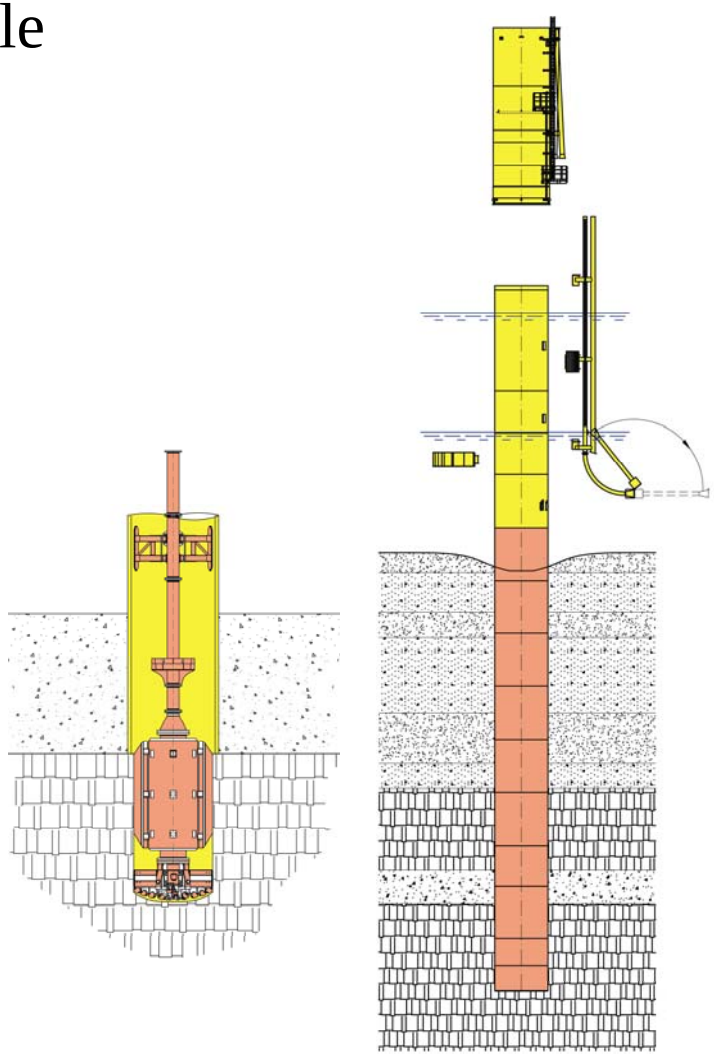
	Seismic study	Side Scan	Bore hole No.	SPT	Coring	In situ Characteristic	Lab Test	Met Mast Driving Results
North Hoyle	X	X	6	X	X	X	X	÷
Scroby Sands	X	X	4	X	X	X	X	X

Geotechnical investigations. Borehole number = number of geotechnical borings.



North Hoyle

Main Parts



Monopile Installation:
Drive – Drill - Drive

NORTH HOYLE 2002-2003

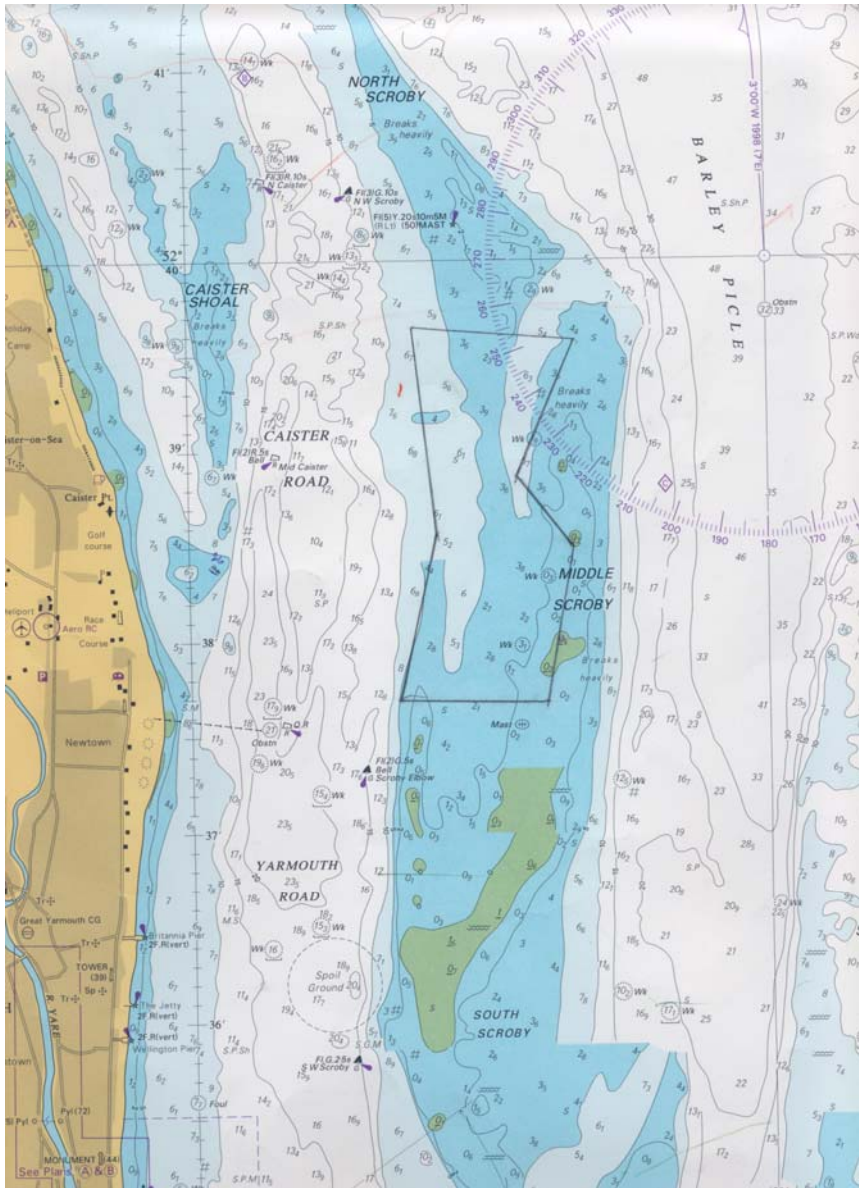
Vestas

Mayflower energy

NWP

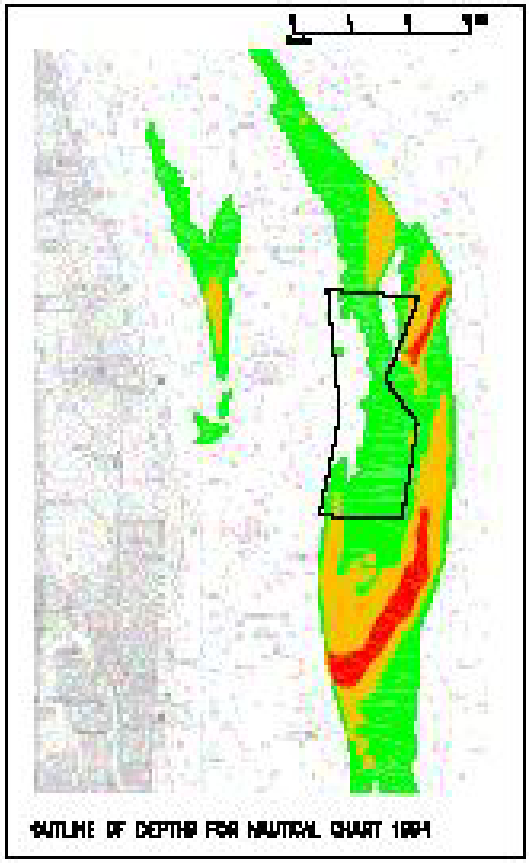
NORTH
HOYLE

NORTH HOYLE

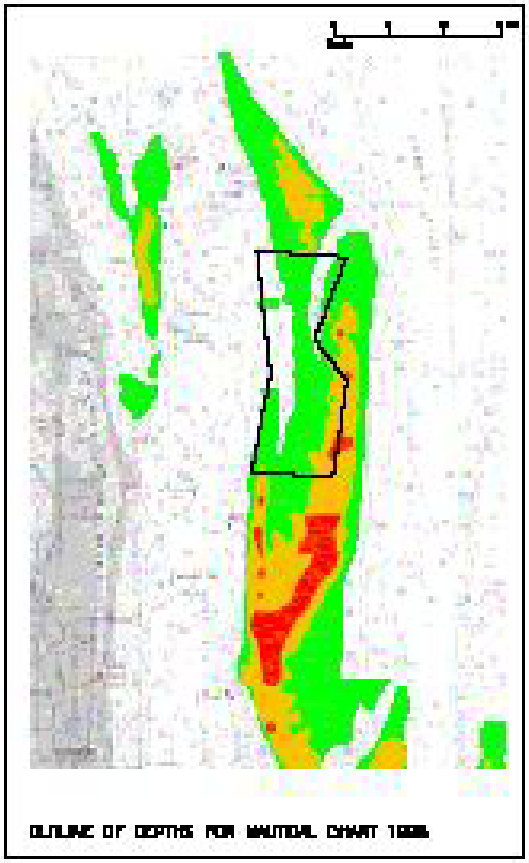


Scroby Sands

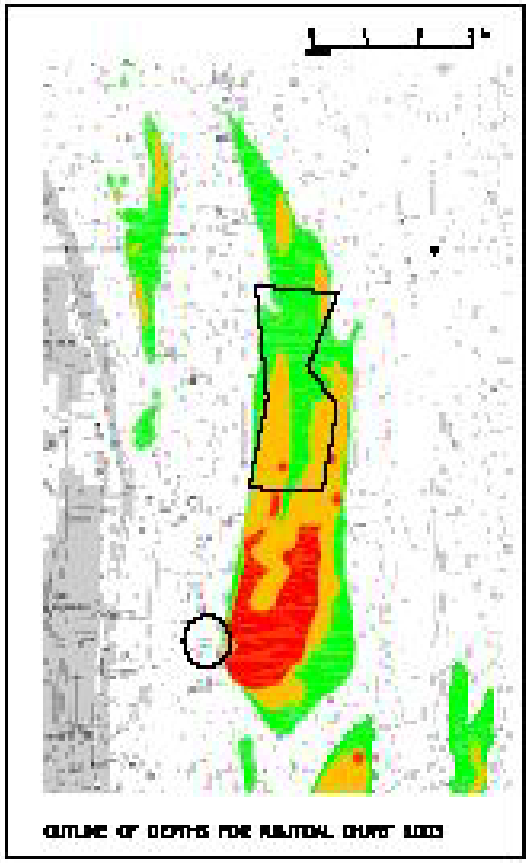
Recent movement of Scoby Sands sand bank



1994

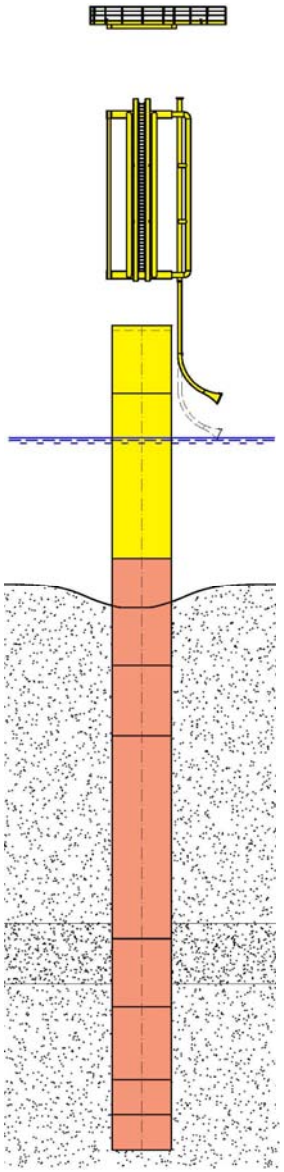


1998



2003

Scroby Sands. Main Parts



SCROBY SANDS – 2003/2004

Copenhagen, 2005

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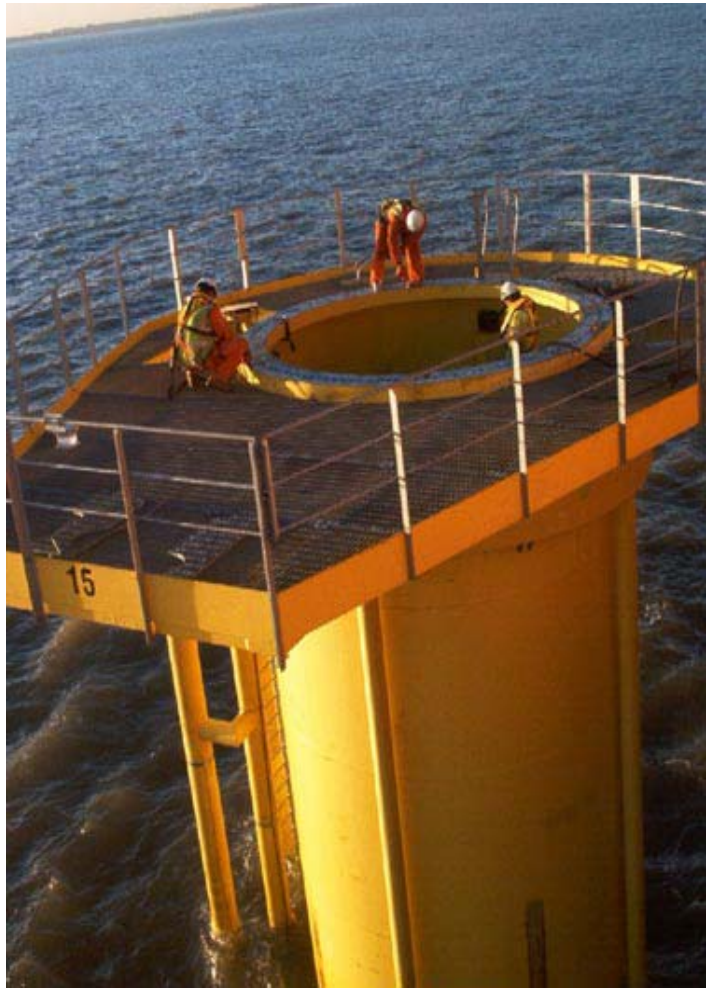
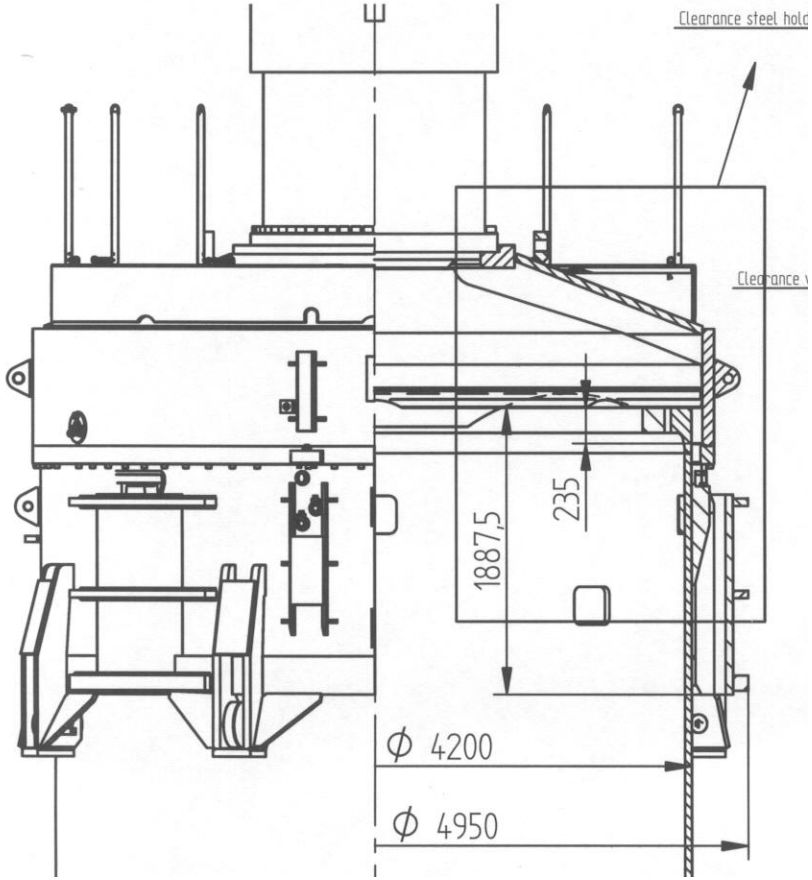
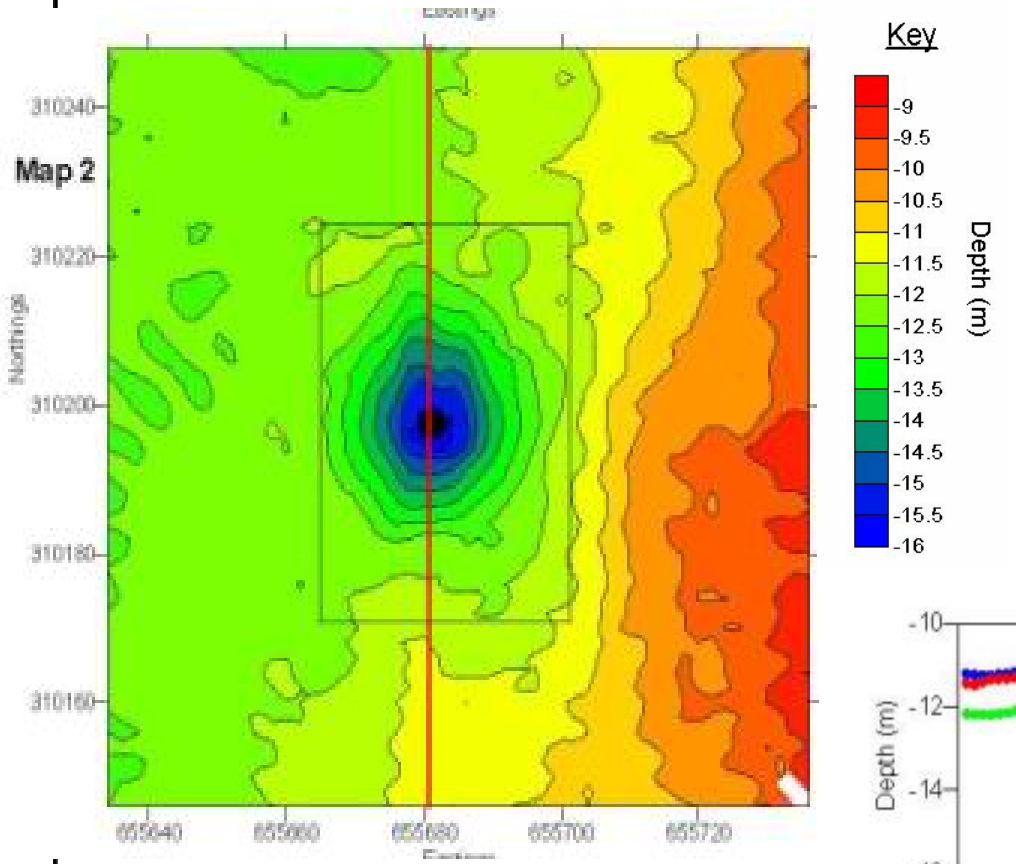
Installation of fender and boatlanding



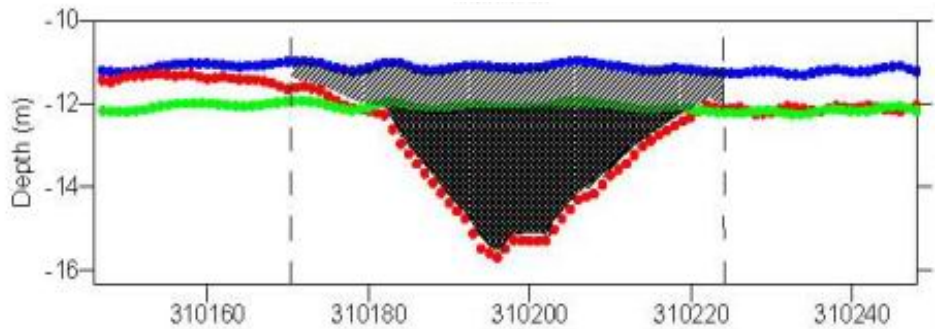
Scroby Sands. Driving with Flange on Pile



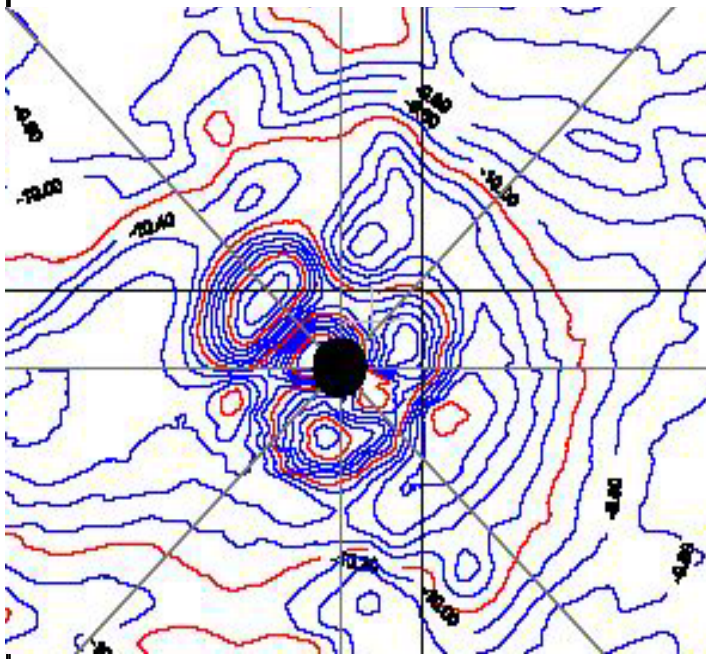
Scroby Sands.
Naturally developed scour hole

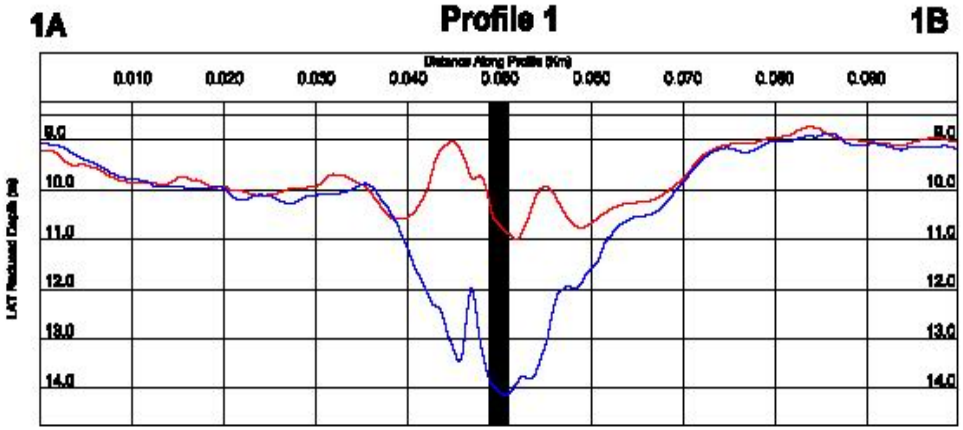


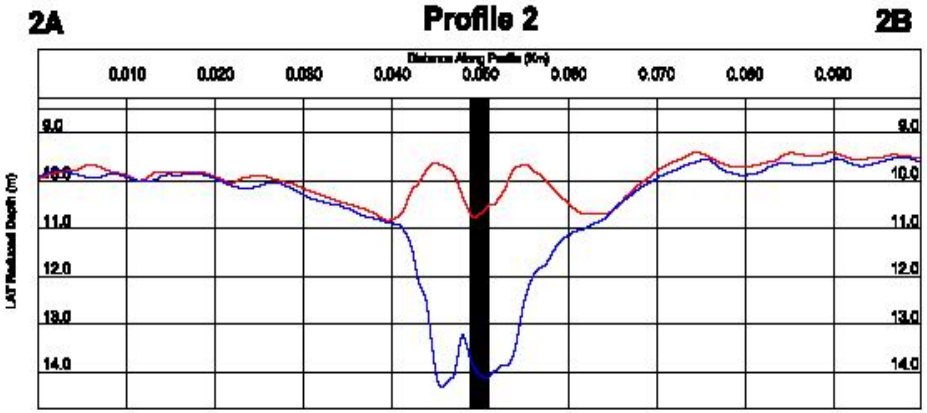
- Time for scour development one spring tide cycles
- Max. scour depth: 1 to 1.5D
- Extension from center ~ 3 to 4 D



Scour protection out-survey







CONCLUSIONS

Many components of monopile foundations can with advantage be made repetitive. They are:

- Transition piece
- Sea acces
- Platform
- Scour protection

J(I) tube system for cable pull-in can be made partially repetitive over the same template.

Piles themselves can only be repetitive to a degree due to economics. At both North Hoyle and Scroby Sands 3 types of piles were used.