37TH INTERNATIONAL NO-DIG FLORENCE 2019

Fortezza da Basso • FLORENCE (Italy)

30th September • 2nd October 2019

Considerations in planning successful trenchless utility installations

Loui Thomsen, COWI A/S Denmark

Agenda

- Uncover and reconcile needs
- Conceptual design
  - Authorities
  - Accessibility
  - Work areas
  - Traffic
  - Geotechnical conditions
  - Other subsoil utility's and structures
  - Method assessment
  - Risk assessment and in some cases an economic assessment
- Detailed design
- Stakeholder, cooperation
- SDG and planning of trenchless installations

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Uncover and reconcile demands

Before considering any of this:

You need to do this:

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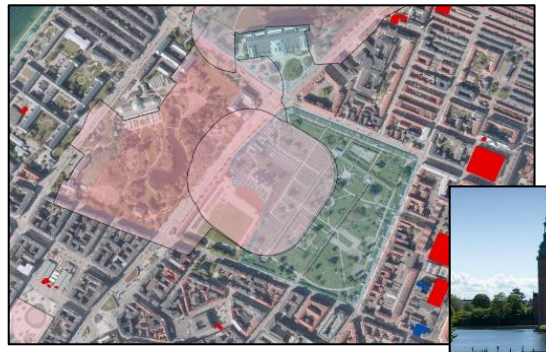
Considerations during the conceptual design process

- Mapping of relevant authorities
- Assessment of accessibility
- Assessment of available work areas
- Assessment of measures to manage traffic
- Preliminary assessment of geotechnical conditions
- Detailed mapping of existing cables and pipelines
- Method assessment: HDD, MT, Auger, DP etc.
- Etc.
- Conceptual planning of vertical and horizontal alignment based on most reasonable available technologies.
- Risk assessment based on multiple possible methods/technologies
- In some cases an economic assessment based on reasonable methods is relevant.



Pipelines for cooling water under palace garden

Pipelines for cooling water under multiple Railway tracks in Copenhagen

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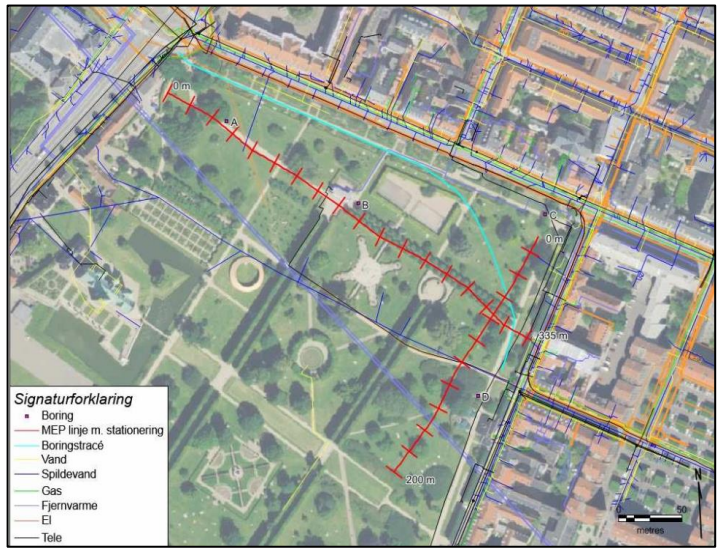
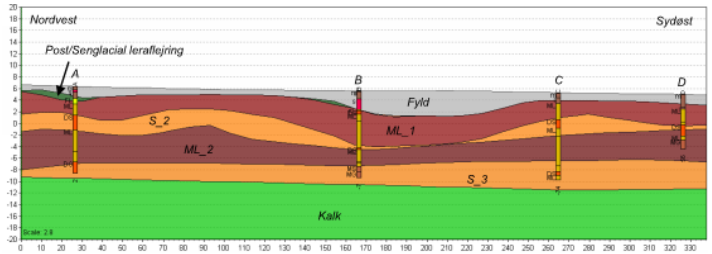
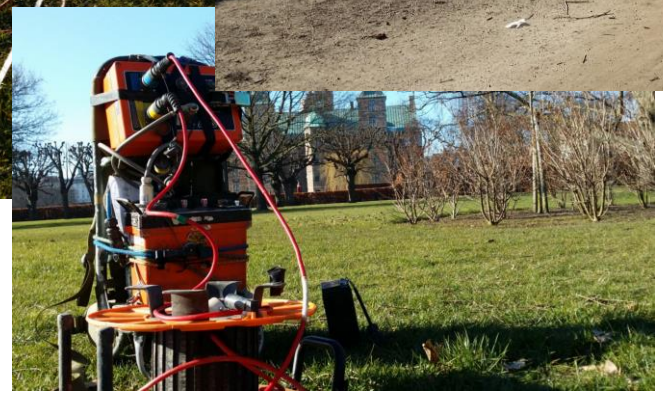
Conceptual design - preliminary geologi

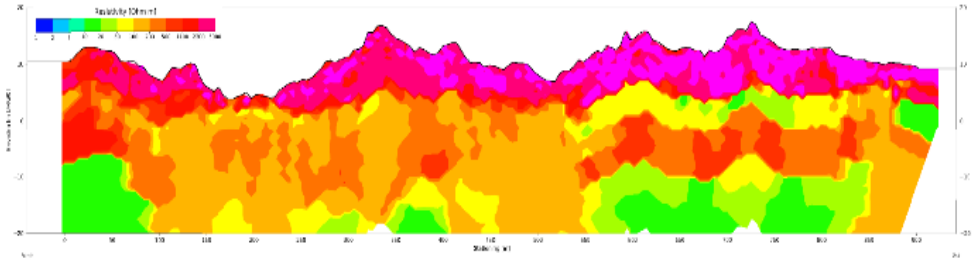
Electrical Resistivity Tomography (ERT)/SVES and DualEM

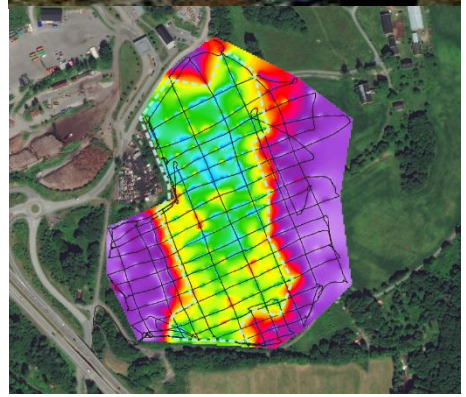




DualEM







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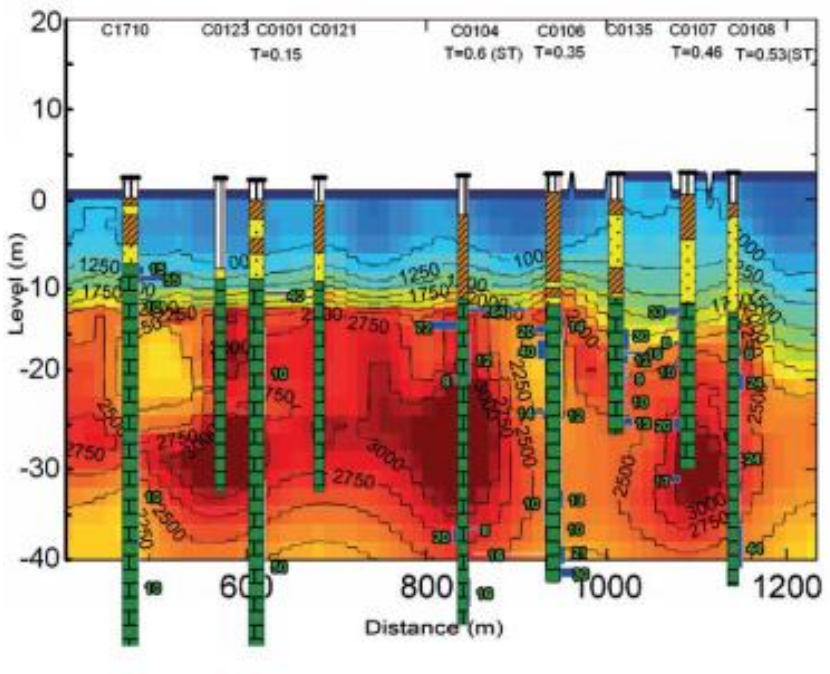
Conceptual design - preliminary geologi

Seismic Survey by Reflection Seismology - often combined with a multi beam investigation of the bathymetry when on water



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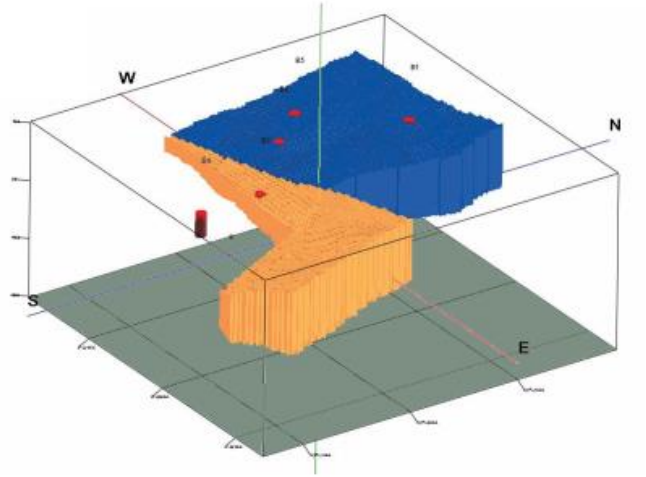
Conceptual design - preliminary geologi

Ground penetrating radar/GPR 2D/3D

- A tool for screening the underground
- Can i.e. detect the following:
  - Mapping of soft soil vs. hard soil and transitions
  - Allowing approximate estimate of geological layers
  - Mapping of bedrock
  - Mapping of permafrost



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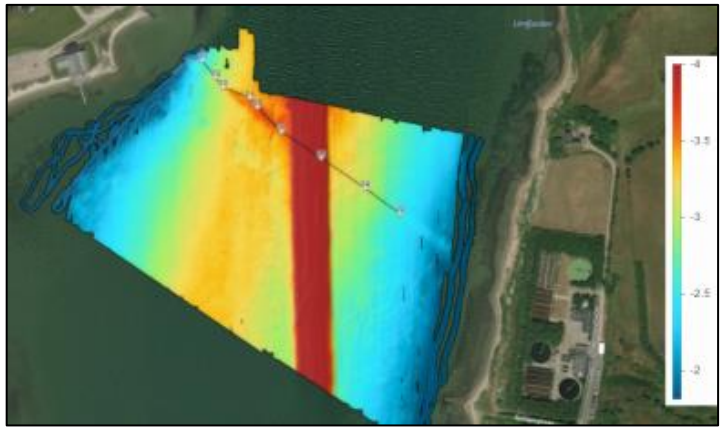
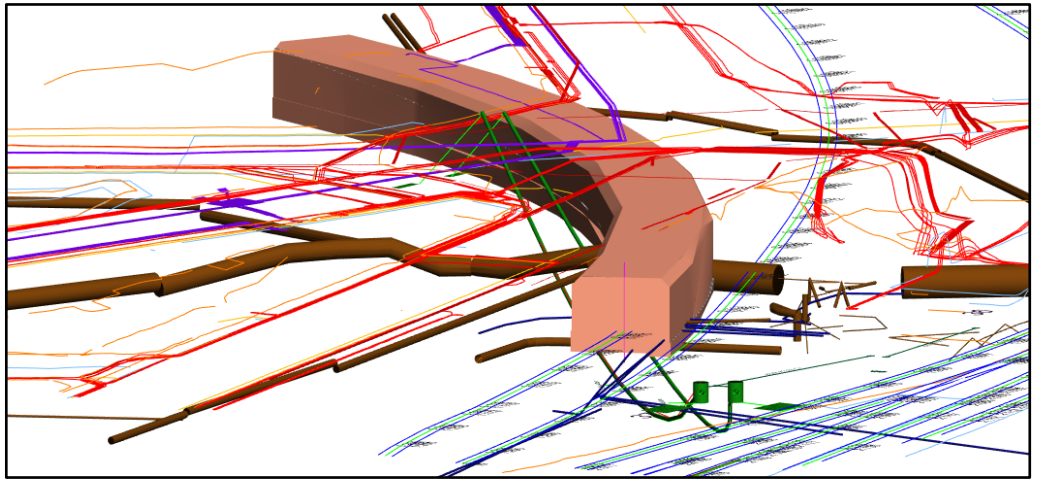
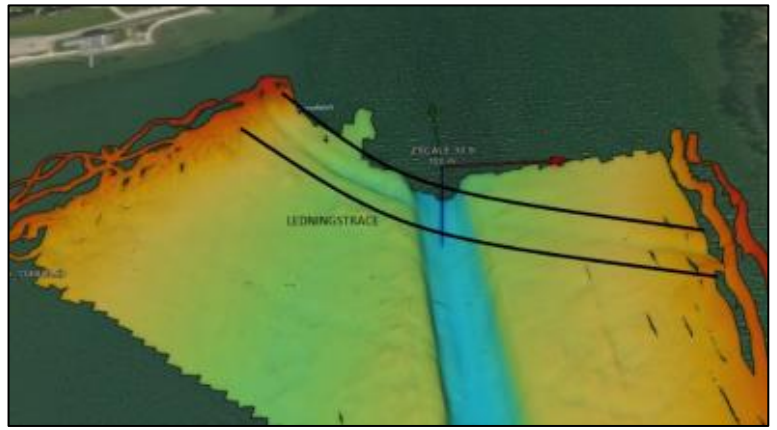
Conceptual design - mapping existing utilities and subsurface structures







- Historic data and national databases
- Seismic Survey
- Ground penetrating radar

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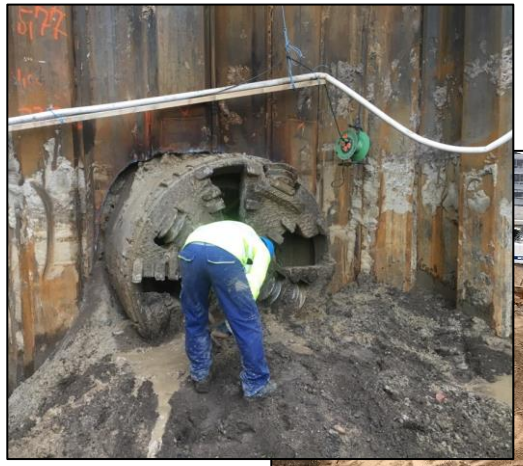
Concept design – assesment of methods



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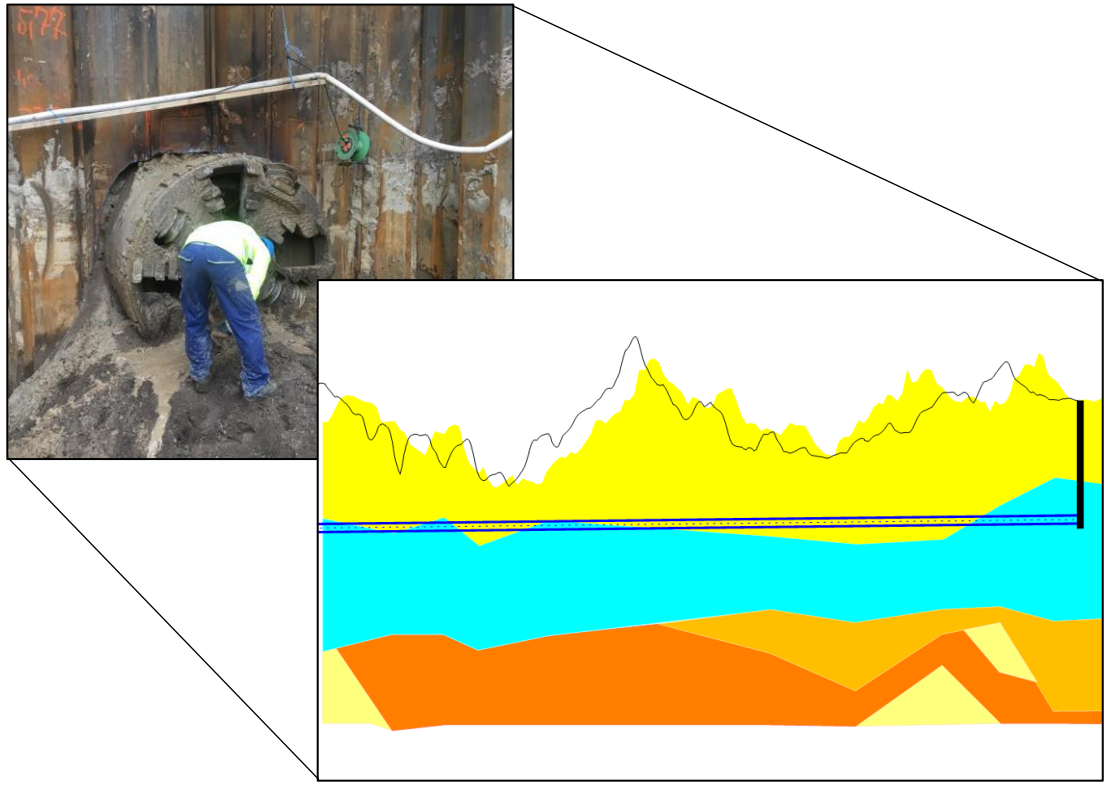
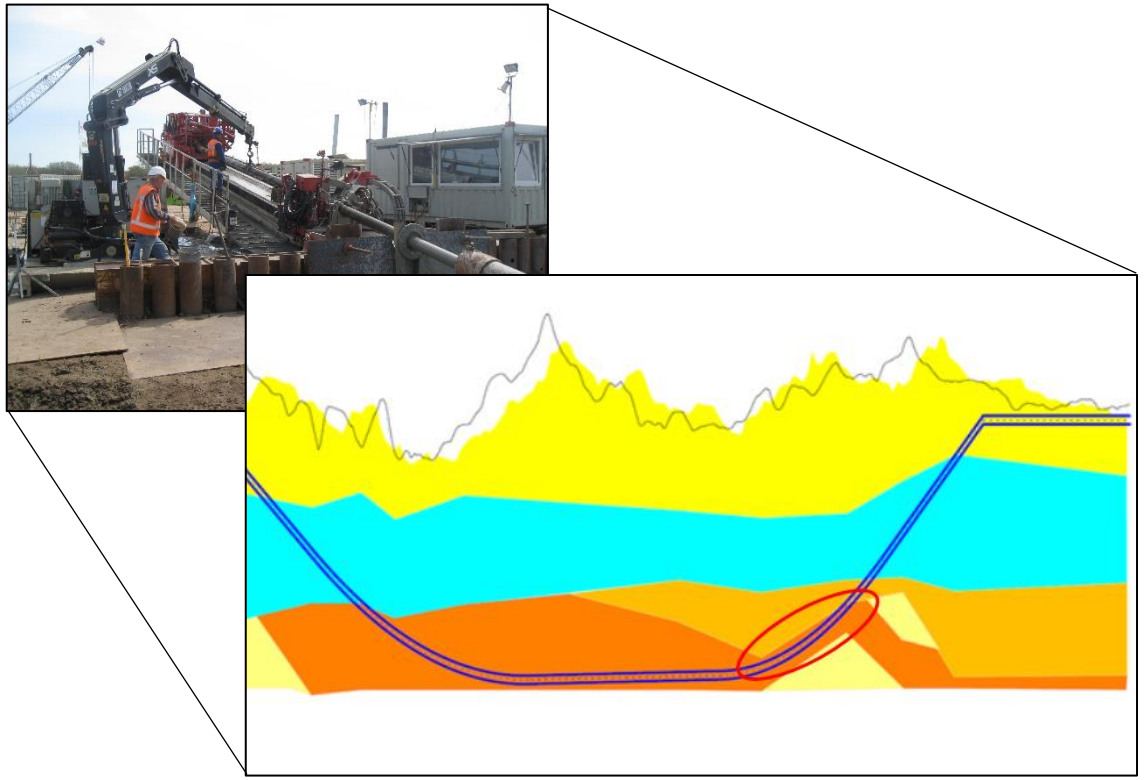
Concept design – assesment of methods





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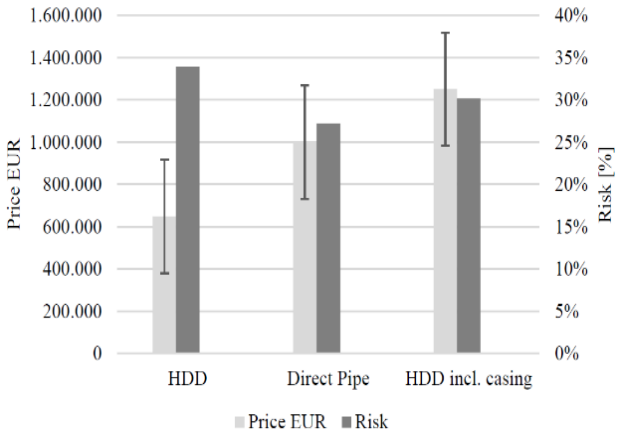
Preliminary alignment and risk evaluation

Riskmatrix		Likelihood		
		1: Low probability	2: Medium probability	3: High probability
Consequence	1: Low	1	2	3
	2: Medium	2	4	6
	3: High	3	6	9

ID	Description of risk	Type of risk	Likelihood	Consequence	Riskvalue
1	Geology	Rock and boulders in moraine deposits	3	3	9
2	Technical	Drill through existing buried cables	2	3	6
3	Geology	Drilling in soil layers with poor strength	1	1	1
4	Geology	Borehole collaps	1	3	3
5	Technical	Loosing mudpressure	2	2	4

Riskvalue	Action
6-9	Requires immediate action
3-5	Requires rapid action
1-2	No immediate action required



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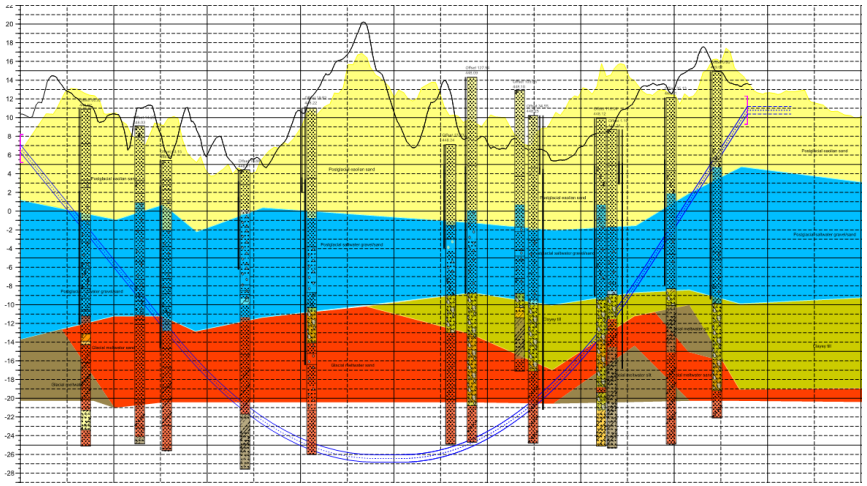
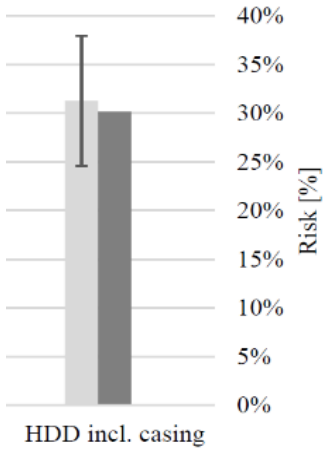
Detailed design considerations

- Detailed investigations and assessment of geotechnical conditions
- Detailed planning of alignment
- Detailed risk assessment based on detailed studies and the final chosen method of establishment.





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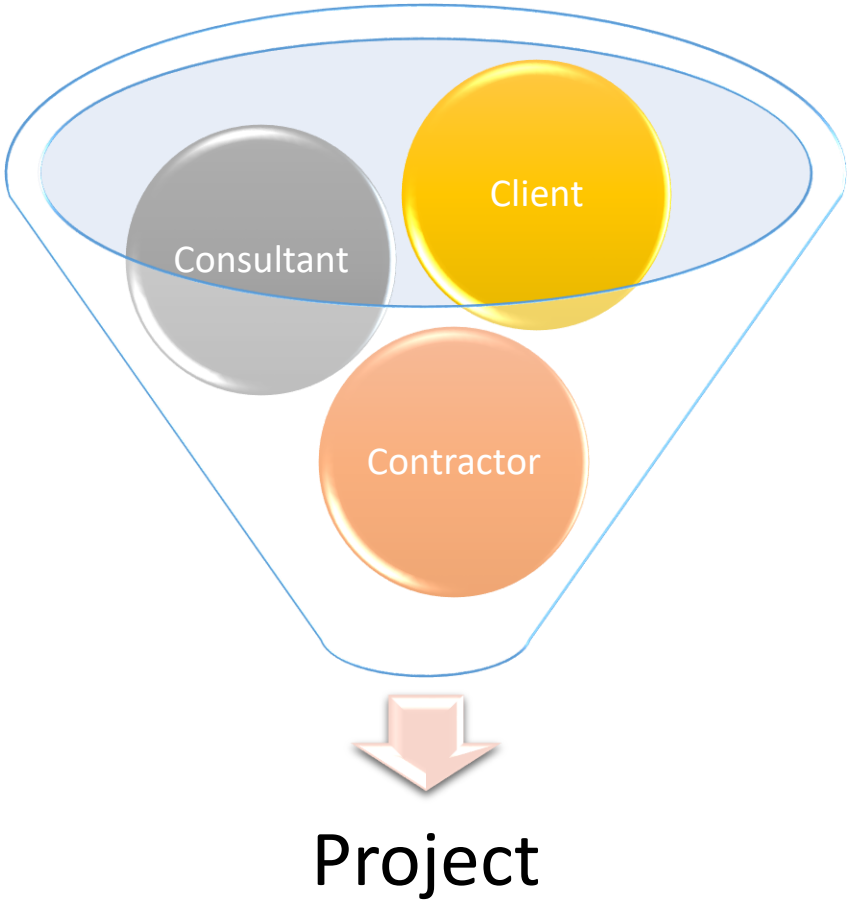
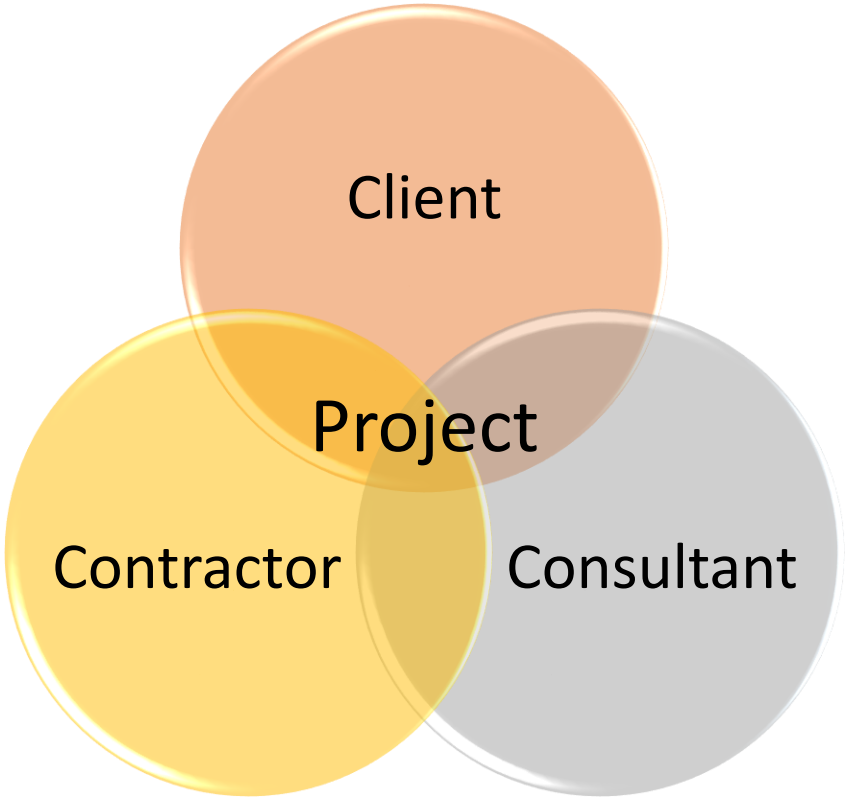
Cooporation amogs stakeholders and Knowledge





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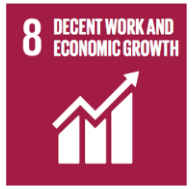
Risk assesment and Sustainable Development Goals, SDG's



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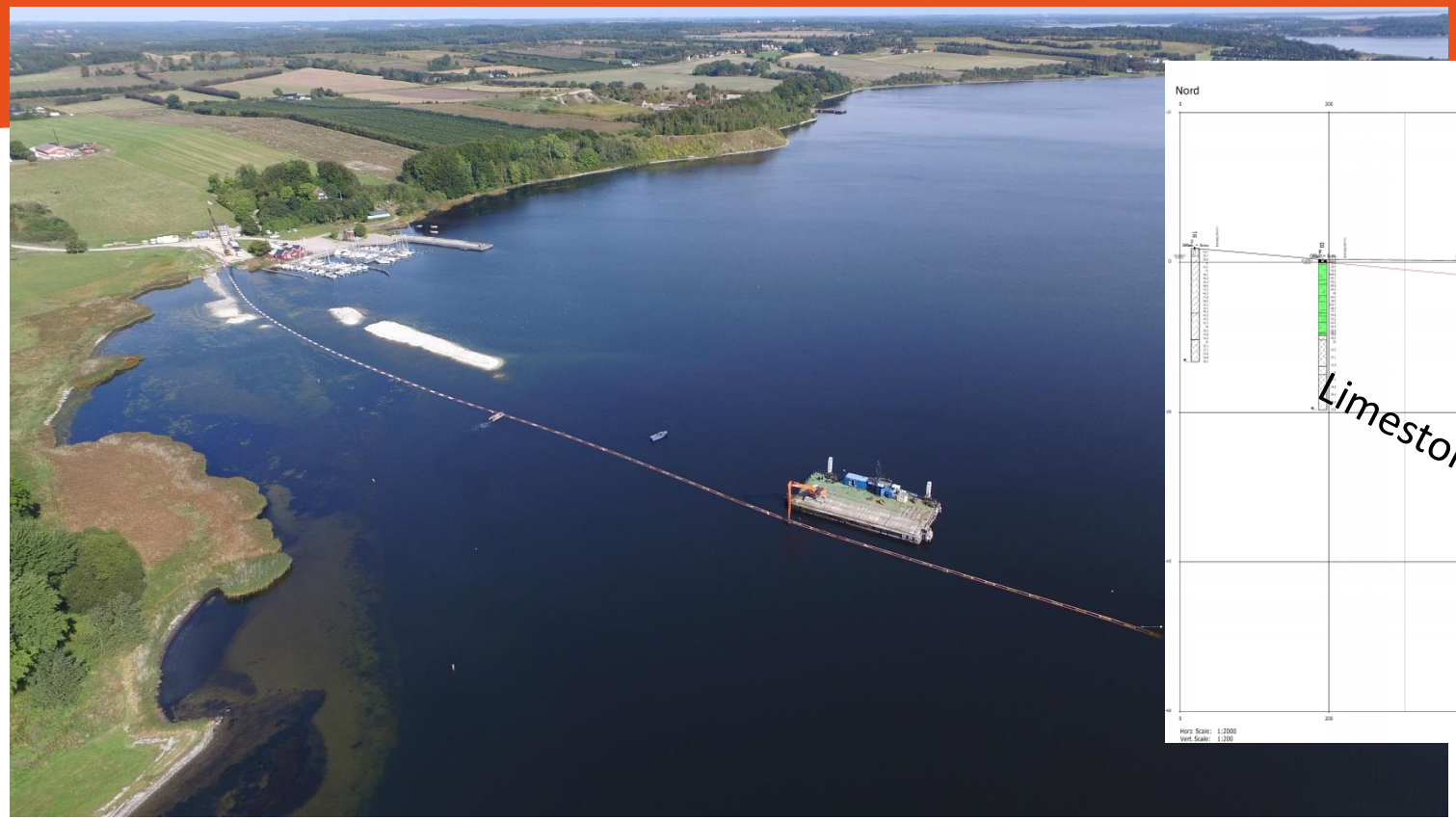
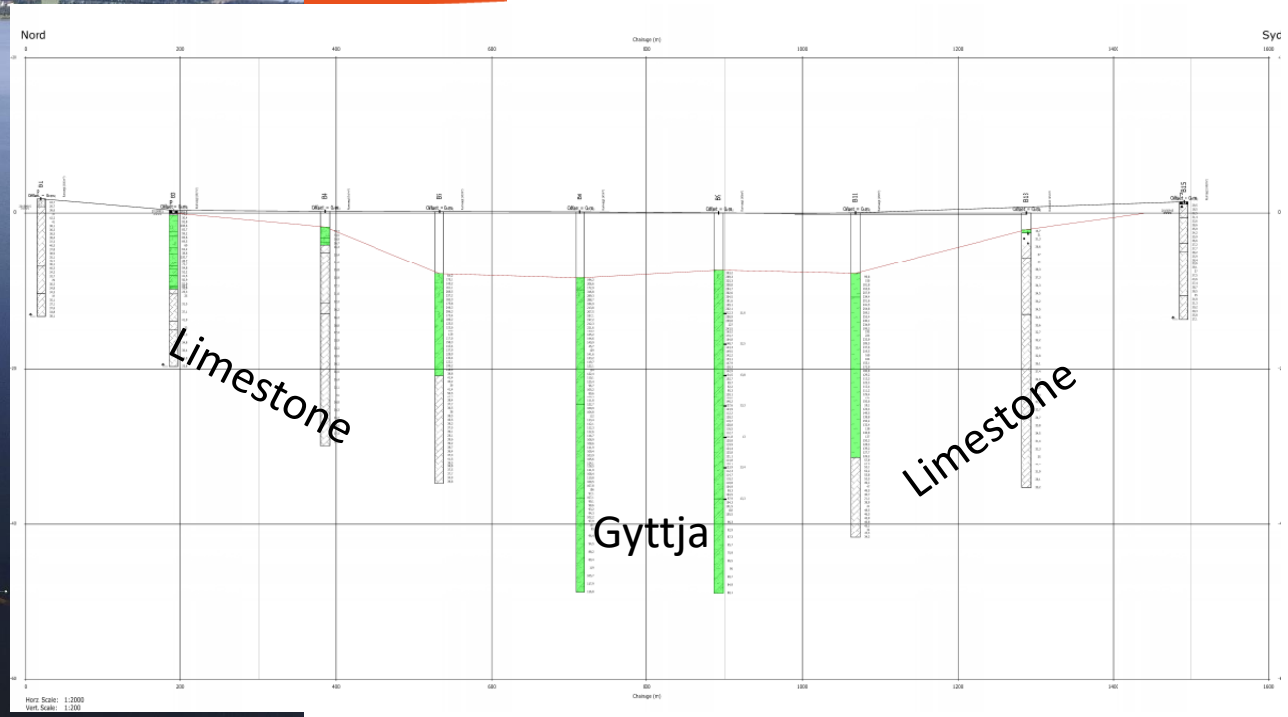
SOME TIMES OTHER METHODS MUST BE CONSIDERED





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Summation

- Reconcile demands and best case whishes, the to are often mixed
- Conduct trenchless ground investigations before conducting geotechnical boreholes. The risk of redundant boreholes or worse poorly placed boreholes is reduced significantly..
- Evaluate the possibilities and consequences of the methods and actual alignements carefully and chritically. **Trenchning og Trenchless. No projects are with out risks but in many cases risks can be reduced if they are known and adressed.**
- Re-reconcile demands while considering the risks and challanges in any given project.

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Thank you for listening

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