Considerations in planning successful trenchless utility installations
Loui Thomsen, COWI A/S Denmark
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
Uncover and reconcile demands

Before considering any of this:

You need to do this:
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.
Electrical Resistivity Tomography (ERT)/SVES and DualEM
Seismic Survey by Reflection Seismology - often combined with a multi-beam investigation of the bathymetry when on water
Conceptual design - preliminary geology

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
Conceptual design - mapping existing utilities and subsurface structures

- Historic data and national databases
- Seismic Survey
- Ground penetrating radar
Concept design – assessment of methods
# Preliminary alignment and risk evaluation

## Risk Matrix

<table>
<thead>
<tr>
<th>ID</th>
<th>Description of risk</th>
<th>Type of risk</th>
<th>Likelihood</th>
<th>Consequence</th>
<th>Riskvalue</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Geology</td>
<td>Rock and boulders in moraine deposits</td>
<td>3</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>2</td>
<td>Technical</td>
<td>Drill through existing buried cables</td>
<td>2</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>Geology</td>
<td>Draining in soil layers with poor strength</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Geology</td>
<td>Borehole collapse</td>
<td>1</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>Technical</td>
<td>Loosing mudpressure</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>

### Likelihood

- **1:** Low probability
- **2:** Medium probability
- **3:** High probability

### Consequence

- **1:** Low
- **2:** Medium
- **3:** High

### Risk Value

- **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.
Cooperation among stakeholders and knowledge
SOME TIMES OTHER METHODS MUST BE CONSIDERED
➢ Reconcile demands and best case wishes, 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 alignments carefully and critically. Trenching og Trenchless. No projects are without risks but in many cases risks can be reduced if they are known and addressed.

➢ Re-reconcile demands while considering the risks and challenges in any given project.
Name: Loui Thomsen
Education: Aalborg University department of civil engineering
Mail: LTMU@COWI.COM
COWI, Aalborg, Denmark
Membership: NoDig Infra (Danish Society of trenchless technology)