

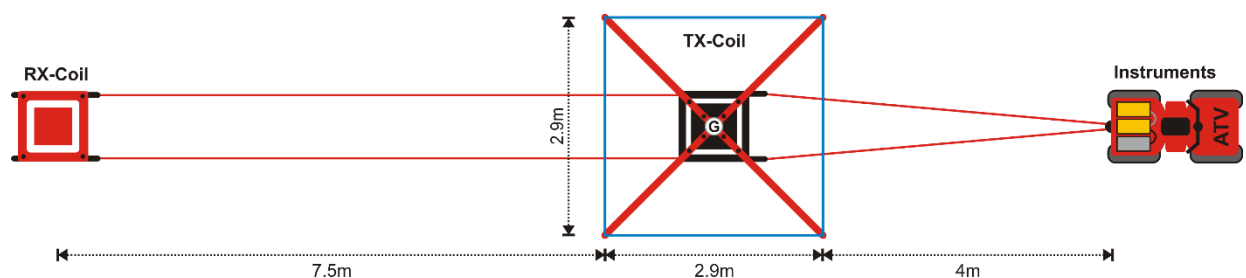
# Attachment 1: Project Description

## Project title:

tTEM survey in Estonia to map complex geological structures

## Project description:

The HydroGeophysics Group of Aarhus University, Denmark developed a ground-based towed transient electromagnetic (tTEM) system. The tTEM system (see figure 1) is designed for detailed 3D geophysical and geological mapping of the shallow subsurface (0-80 m) in a fast and cost-efficient way. The system is towed by means of an all-terrain vehicle (ATV), allowing mapping speeds of up to 20 km/h. The detailed 3D coverage is obtained by fast data repetition and a small line spacing of typically 10-20 m. The transmitter electronics, receiver, power supply, etc. are located at the back of the ATV.



**Figure 1:** The tTEM system includes Rx-Coil and Tx-coil, indicating the receiver coil and transmitter coils, respectively, both of which are mounted on sledges. The yellow boxes on the ATV represent the receiver and transmitter electronics, while the grey box is the battery-box for power supply. The GPS is located on the TX unit.

The tTEM system is quick to deploy and easily managed by a field crew of two persons. The tTEM-system consists of an ATV, carrying the instrumentation and towing the transmitter frame and the receiver coil. The transmitter and receiver coils are mounted on sledges to ensure a smooth with minimal disturbance ride over rough fields/terrain. With the tTEM system, it is possible to map up to 100 hectares per day, thereby offering a robust hydrogeological basis for groundwater and land-use management.

In the project, Aarhus University and the Geological Survey of Estonia will use the tTEM system to map the geological setting at 2-3 selected test sites. The exact sites to be mapped will be decided jointly on an online meeting to be held prior to fieldwork. The acquired data will be compared with existing geological maps and borehole log information to assess the geological setting and evaluate the feasibility of applying the tTEM method to specific geological conditions.

In the project, Aarhus University, HydroGeophysics Group will contribute with the following:

- Conducting pre-mapping planning in partnership with the Geological Survey of Estonia, utilizing satellite imagery and relevant GIS themes, including infrastructure and the locations of valuable boreholes, etc.
- Conduct tTEM survey, including operating the instrumentation, and performing daily quality control of incoming data.
- All data handling workflows, including data processing, inversion, and compilation of geophysical results.

- Host an online workshop for a detailed discussion of the results, including , an analysis of the hydrogeological sequences derived from the tTEM data.
- Provide a detailed report with all the survey activities, data handling procedures, presentation of all the results, and a discussion of the hydrogeological interpretation.
- Both parties will do their utmost to disseminate the results to local and internal partners.
- Host a training course in connection with the course. The course will include training on data processing and interpreting tTEM data. All relevant software will be provided in-kind for the training by Aarhus University. For the training course, we will use the acquired data from the tTEM mapping.

In the project, the Geological Survey of Estonia will contribute with the following:

- Field access and contacting relevant authorities and land-owners to obtain mapping permission.
- Providing assistance with locating the project sites to be surveyed.
- Background material such as existing borehole log information, GIS maps and other relevant material.
- Providing assistance with personnel for the mapping, who should be fluent in the local language and help facilitate field access, among other tasks.
- Comparison of the geophysical results with other information such as boreholes, geological maps etc.
- Participate in an online workshop for discussing the geophysical results.
- Both parties will do their utmost to disseminate the results to local and internal partners.

#### **Project duration:**

The fieldwork and training course should be carried out in the time period of May-June 2024. The data processing and interpretation of the acquired tTEM data should be carried out subsequently. The results of the mapping will be documented in a geophysical data report, which is due one month after the completion of the fieldwork. Aarhus University is responsible for drafting the report while the Geological Survey of Estonia will review and suggest changes as per needed. The report should thus be considered a joint report. Aarhus University will host an online workshop in Aarhus where the geophysical results can be discussed. Both parties will do their utmost to disseminate the results to local and internal partners. Finally, Aarhus University and the Geological Survey of Estonia Mainz will pursue publication of the findings in peer-reviewed journals. Therefore, the total duration of the project is expected to be two years, starting on March 1, 2024, and ending on March 1, 2026..

## Attachment 2: Budget

The table below states the project budget.

tTEM EGT Demonstration Estonia			
Transport costs Aarhus-Talinn-Aarhus	Number	Unit price (DKK)	Price(DKK)
Mobilization, planning, driving cost, 2 persons, per day	2	7000	14000
Transport cost, number of km	2010	4	8040
Ferry Molslinjen, tour	1	1598	1598
Ferry Kapellskär - Paldiski, tour	1	3520	3520
Per diem, 2 persons, per day	2	1148	2296
Sub total			29454
Mapping & Data processing course	Number	Unit price (DKK)	Price(DKK)
Field days & training, 2 persons, per day	6	7000	42000
Per diem, 2 persons, per day	6	1148	6888
Hotel 2 persons, per day	5	1200	6000
Sub total			54888
Sum			84342
44% university overhead			37110
<b>Total</b>			<b>121452</b>

### Financial terms and conditions:

- All equipment necessary to conduct the survey is included in the cost estimate.
- Software needed for the data processing course is provided in-kind during the duration of the course.
- Aarhus University is responsible for invoicing the full amount upon completion of the final report. The final report is due one month following the fieldwork, at latest.
- Partner is responsible for field access and contacting relevant authorities and land owners with respect to mapping permission