

APPENDIX 2

INSTRUMENTATION, PROCESSING AND INVERSION SETTINGS

The WalkTEM instrument is a time-domain electromagnetic systems designed for hydrogeophysical and environmental investigations. The instruments were developed based on many years of research at Aarhus University in Denmark. The experience dates back to the development of the pulled-array TEM (PATEM) system and later the SkyTEM airborne system.

WalkTEM Instrument

This section describes the WalkTEM instrument setup and system specifications. The information is provided to give an in-depth understanding of the data collection, processing and inversion.

WalkTEM Instrument Setup

The WalkTEM field configuration used in this survey is named "central loop" configuration. It comprises a 40 m x 40 m (130 ft x 130 ft) square-shaped transmitter (Tx) loop, along with a 10 m x 10 m (33 ft x 33 ft) 2-turn receiver (Rx) loop placed in the center of the transmitter loop. The Tx and Rx loops are connected to the WalkTEM instrument, which is placed at the corner of the Tx loop. The instrument is supplied with a 12V external battery (Figure A2-1).

The instrument runs on a built-in windows computer. It also has a built-in keypad to ease operation of the system. The acquisition software is linked to a simplified inversion program that enables quick analysis of the data at the site.

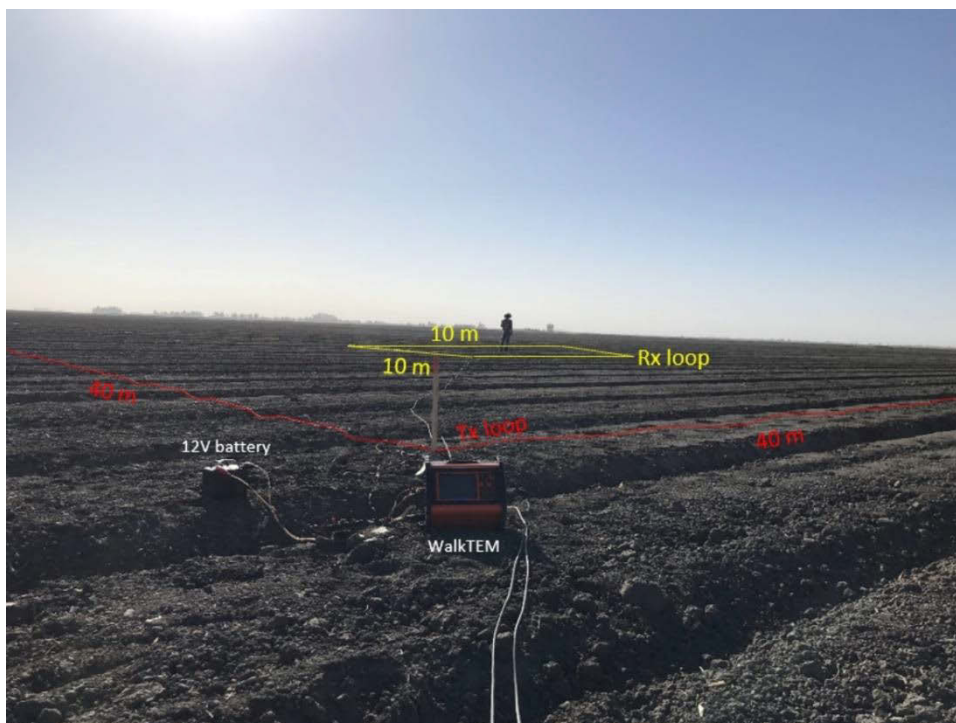


Figure A2- 1 A representation of the WalkTEM system configuration in the field.

Measurement Cycle

The basic settings of the instrumentation are shown in Table A2- 1. In this study, a measuring script consisting of 45 time gates was used to achieve maximum depth of investigation.

Parameter	LM	HM
Moment ID	2	1
No. of turns	1	1
Transmitter area (m2)	1600 m2	1600 m2
Tx Current	~ 1 A	~ 8 A
Tx Peak moment	~ 1600 Am2	~ 12800 Am2
Number of gates	25	32
Gate time interval (gate center time)	9.19 μ s – 706 μ s	35 μ s – 22.16 μ s

Table A2- 1 Basic settings of the instrumentation.

System Calibration

The WalkTEM instrumentation described above was tested and calibrated at the Danish national geophysical test-site near Aarhus, Denmark. The purpose for the test and calibration is to document the performance of the instrument and to defined absolute calibration parameters.

The calibration is performed to establish the absolute time shift and data level to facilitate precise modeling of the data. No additional levelling or drift corrections are applied. To perform the calibration, all system parameters (transmitter waveform, low pass filters, etc.) must be known to allow accurate modeling of the WalkTEM setup. The calibration constants are determined by comparing a recorded WalkTEM response on the test site with the reference response. The reference response is calculated from the test site reference model for the used WalkTEM configuration.

Acceptable calibration was achieved with the calibration constants stated in Table A2- 2. The scale factors of 1.04 and 1.02 (4% and 2%) are very acceptable. The time shift is deemed due to the delays in the electronics and inaccurately modelled waveforms. The obtained time shifts are very acceptable.

Moment	Time Shift	Scale Factor
LM	-1.70 μ s	1.04
HM	-1.60 μ s	1.02

Table A2- 2 Calibration constants.

Processing and Inversion Software Settings

The processing and inversion are based on the Aarhus SPIA software, version 3.5.1.0. A 20-layer model has been applied. Table A2- 3 lists the fixed layer thicknesses, depth to bottom of layer and the initial resistivity assigned to the model layers (a homogenous half space).

Layer	Thickness [Meter]	Depth [Meter]	Start value [Ohm-m]
1	4.30	4.30	50
2	4.86	9.16	50
3	5.48	14.64	50
4	6.19	20.84	50
5	6.99	27.83	50
6	7.89	35.72	50
7	8.91	44.63	50
8	10.06	54.69	50
9	11.36	66.05	50
10	12.82	78.87	50
11	14.48	93.35	50
12	16.34	109.69	50
13	18.45	128.14	50
14	20.83	148.97	50
15	23.52	172.49	50
16	26.55	199.04	50
17	29.98	229.02	50
18	33.84	262.86	50
19	38.21	301.07	50
20	--	--	50

Table A2- 3 Outline of the 25-layer model.