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COBRA PLUG-IN GPR

Real time sampling with **0-120 m**

PENETRATION

CUTTING-EDGE TECHNOLOGY – High Penetration Real Time Sampling GPR

MONOSTATIC ANTENNA – Better performance vs. conventional bistatic GPR

AIRBORNE & AIR-COUPLED – Easy to operate, even in non-walkable terrain

PERFORMANCE – 45 dB increased S/N-ratio versus conventional GPR

GPR – Fits all our popular low frequency SE-antennas

HANDHELD RUGGED CONTROL UNIT – Included, with DGPS

WIRELESS BLUETOOTH OPERATION – No cables, less ringing

LOW POWER CONSUMPTION – 16 hours between charges

COMPACT AND LIGHT – Complete system below 7 kg

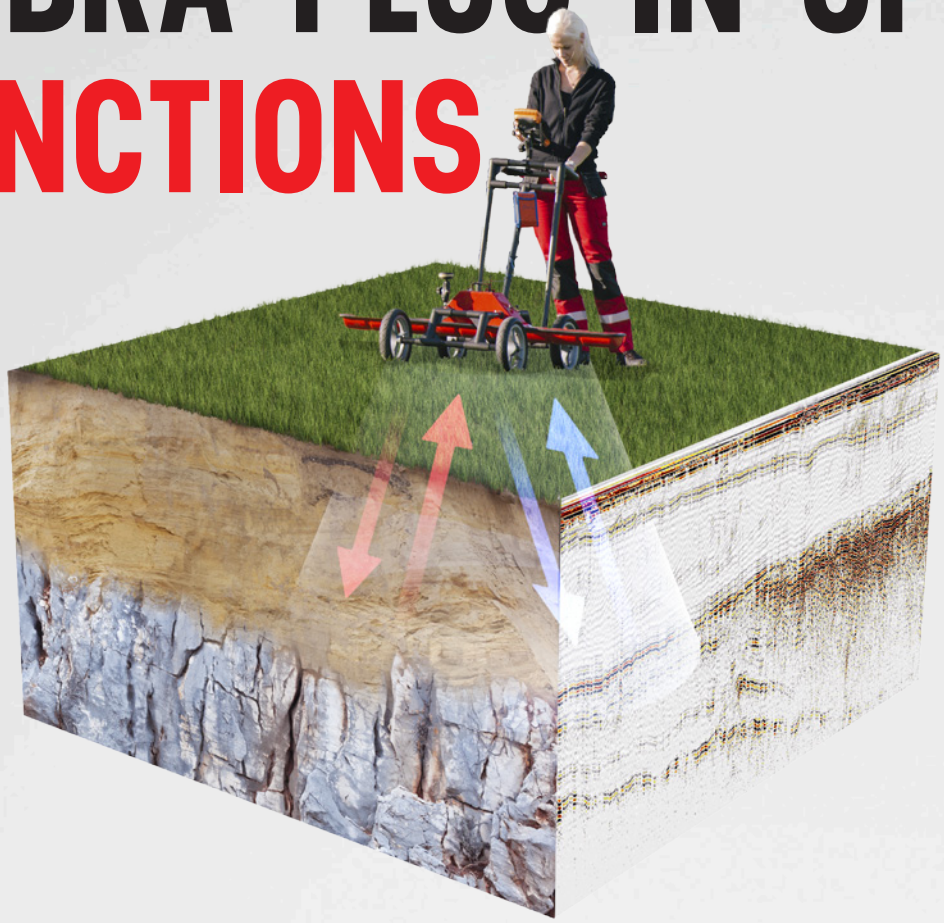
UNPARALLELED PENETRATION – Up to 120 m depths

LOW TRANSMITTER OUTPUT – Less ringing in data

POST PROCESSING SOFTWARE – Included

**REPLACE YOUR POWER-HUNGRY, BULKY,
GROUND-COUPLED CONVENTIONAL GPR-SYSTEM**

COBRA PLUG-IN GPR FUNCTIONS



REAL TIME SAMPLING

The Cobra Plug-In GPR uses Real Time Sampling of the radar signal. Today major manufacturers use conventional interleaved sequential sampling, giving only a down converted replica of the real signal.

The Real Time Sampling allows for 32,000 stacks/second resulting in an amazing 45 dB increased signal-to-noise ratio.

Note that only a 30 dB increased S/N-ratio roughly double the penetration ability of a typical conventional GPR-system.

A low voltage transmitter reduces power consumption and eliminates ringing. The use of power-hungry, high voltage transmitters is no longer needed; in such case transmitter power must be increased 32,000 times to be comparable!

WIRELESS

Wireless Bluetooth connection between GPR and control unit replaces interfering coax-cables and fragile fibre optic links. An Ultra Rugged Mesa PDA with embedded software is used for data collection. Data is stored in standard SEGY geophysical format.

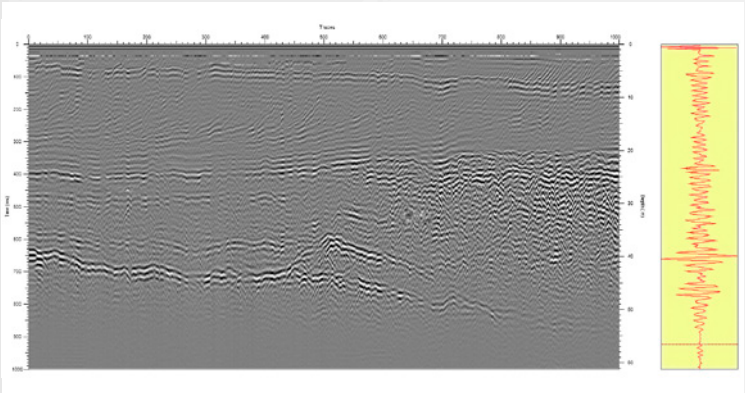
The complete GPR-unit plugs into a single SUBECHO Antenna, any selectable model. No need for bistatic configuration.

The SUBECHO-antennas can all be used airborne and in air-coupled operation and in any type of terrain. No need to cut trail paths anymore, not even in dense bush vegetation were ground coupled snake antennas have problems passing. Just lift the antenna above the bushes or in worst case use an octocopter UAV to carry the small and compact Cobra Plug-In.

Wireless operation, hand held data logger, low power consumption and an air coupled antenna add flexibility, ruggedness and durability and the most compact and deepest penetrating GPR-system available on the market.

Maximum penetrations in good conditions, low conductivity, are listed below:

COBRA PLUG-IN SAMPLE DATA



SOIL TYPE	Dry soil	Average soil	Wet soil	Very wet soil	Water
RDP-VALUE	εr=4	εr=9	εr=16	εr=25	εr=81
Depth @ 1600 ns	120 m	80 m	60 m	48 m	27 m

REAL TIME SAMPLING ADVANTAGE

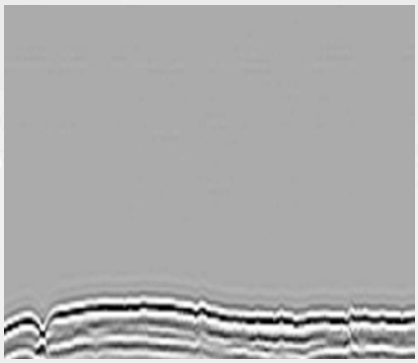
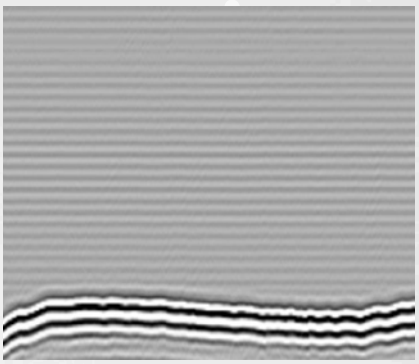
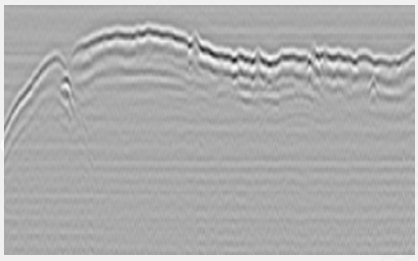
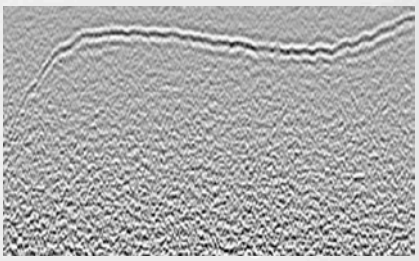
In February 2012 we made a comparison study between the **COBRA PLUG-IN GPR**, a Real Time Sampling GPR, and a conventional Sequential/ Interleaved Sampling GPR, the GSSI SIR-3000 GPR.

The performance study was made the same day, on an ice road passing Lule River and used the same **SE-150** model antennas.

THE DATA

The data below shows the same 115 m long distance with cut raw data from the systems, top sample from 200 to 500 ns range and bottom sample from 1000 to 1200 ns range. The samples clearly illustrate the advantage of using Real time Sampling Technology compared to conventional sampling

- **LESS RINGING**
  – Explained by wireless operation, no cables and lower transmitter output voltage (40V vs. 1200V)
- **LESS HIGH FREQUENCY NOISE**
  – Seen as "snow" or "speckle" in the lower sample SIR-3000 data. (45 dB increased S/N-ratio)
- **BETTER RESOLUTION**
  – Monostatic antenna for Cobra Plug-in GPR and Bistatic for SIR-3000 (Smeared reflections with SIR-3000)

	COBRA PLUG-IN GPR RAW DATA	SIR-3000 GPR RAW DATA
CUT DATA RANGE 200-500 ns		
CUT DATA RANGE 1000-1200 ns		

GPR-SYSTEM: Radarteam Cobra Plug-In
GPR-TYPE: Real Time Sampling System
PRF-RATE: 156 kHz
TIME RANGE: 0-1,600 ns
TRANSMITTER: Utsi Electronics Ltd, 40 V

ANTENNA: Radarteam SE-150 (1 monostatic mode)
ANTENNA DEPLOYMENT: Handheld 60 cm above ice
STACKING: 32,000 stacks/s
POWER: Integrated 11.1 V/ 6.6 Ah, 73 Wh
OPERATING TIME: 16 hours continuous
TOTAL WEIGHT: 5 kg (including battery)

GPR-SYSTEM: GSSI SIR-3000
GPR-TYPE: Time Equivalent Sampling, 512samples/trace
PRF-RATE: 50 kHz
TIME RANGE: 0-1,200 ns
TRANSMITTER: Geoscanner AB, VHT-501, 1200 V
HIGH POWER SUPPORT: Geoscanner AB, PRF-600
RECEIVER: Geoscanner AB, RX-501
ANTENNAS: Radarteam SE-150 (2 in bistatic mode)
ANTENNA DEPLOYMENT: Cart, 10 cm above ice
STACKING: 5 stacks
POWER: 73 Wh (SIR-3000), SLA 12V (PRF-600)
OPERATING TIME: 4 hours continuous
TOTAL WEIGHT: 23 kg (including batteries and cart)

CART WITH TACTICAL CRADLE

CAR TRAILER KIT

RECOMMENDED OPTIONAL ITEMS

Enhance your survey experience

HANDLE & CRADLE

APPLICATIONS & USES

The **COBRA PLUG-IN GPR** can be used to see the inside of very deep materials and structures up to 120 m depths

GEOTECHNICAL SAFETY APPLICATIONS

Geotechnical stratigraphy and soil structure studies.

Depth to bedrock.

Identify voids under: roads, airports, tunnels, railways.

Safety control of embankment dams (piping/voids in core and fractures in bedrock under dam).

Control of remaining barrier distance to abandoned water filled tunnels in coal mines (must exceed 60 m for safety).

Airborne mapping of frazil ice build up in streaming water.

Tunnel & rock quality inspection.

Karst caves and sinkhole mapping.

Mapping of frost sensitive soils under roads- and railways.

SNOW & ICE RESEARCH

Airborne and ground based mapping of glacier ice thickness.

Airborne detection of dangerous crevasses before passing

GROUNDWATER AND MINERAL PROSPECTING

Groundwater supply from sand- and gravel deposits.
Detection of water bearing fracture zones in bedrock.
Locate gemstone pockets in pegmatite,
nickel laterite, bauxite delineation.
Kimberlite exploration.
Mineral placer exploration-paleochannels.
Sand & gravel deposits exploration.
Peat bog investigation and mapping.
Marble prospecting and quality inspection.

ENVIRONMENTAL SURVEYS

Locate hazardous waste.
Delineation of landfills, contaminant plumes and product spills.
Mapping of water and sediment depths of lakes and rivers.

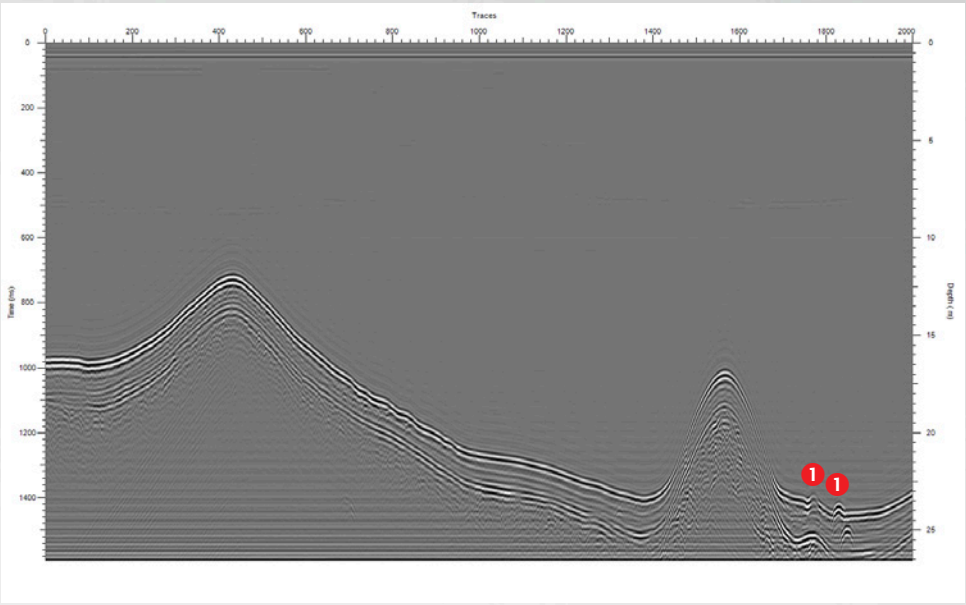
ARCHEOLOGY

Mapping of deep buried structures, pyramids, tunnels and chambers.

MILITARY & SECURITY

Locate deep clandestine tunnels/bunkers in militarized zones
and around borderlines and prisons.

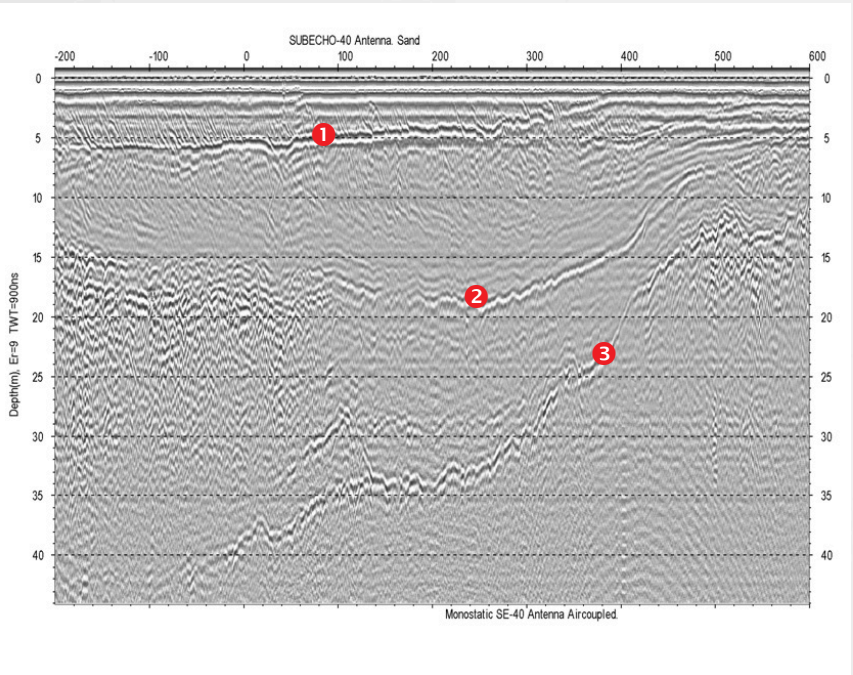

COBRA
BATHYMETRY



DEEP PENTRATION IN LAKES AND RIVERS
BATHYMETRIC MAPPING OF WATER AND SEDIMENTS
COBRA PLUG-IN SAMPLE DATA

1 Targets in 5 m sediment layer at 25 m depth

GROUNDWATER PROSPECTING

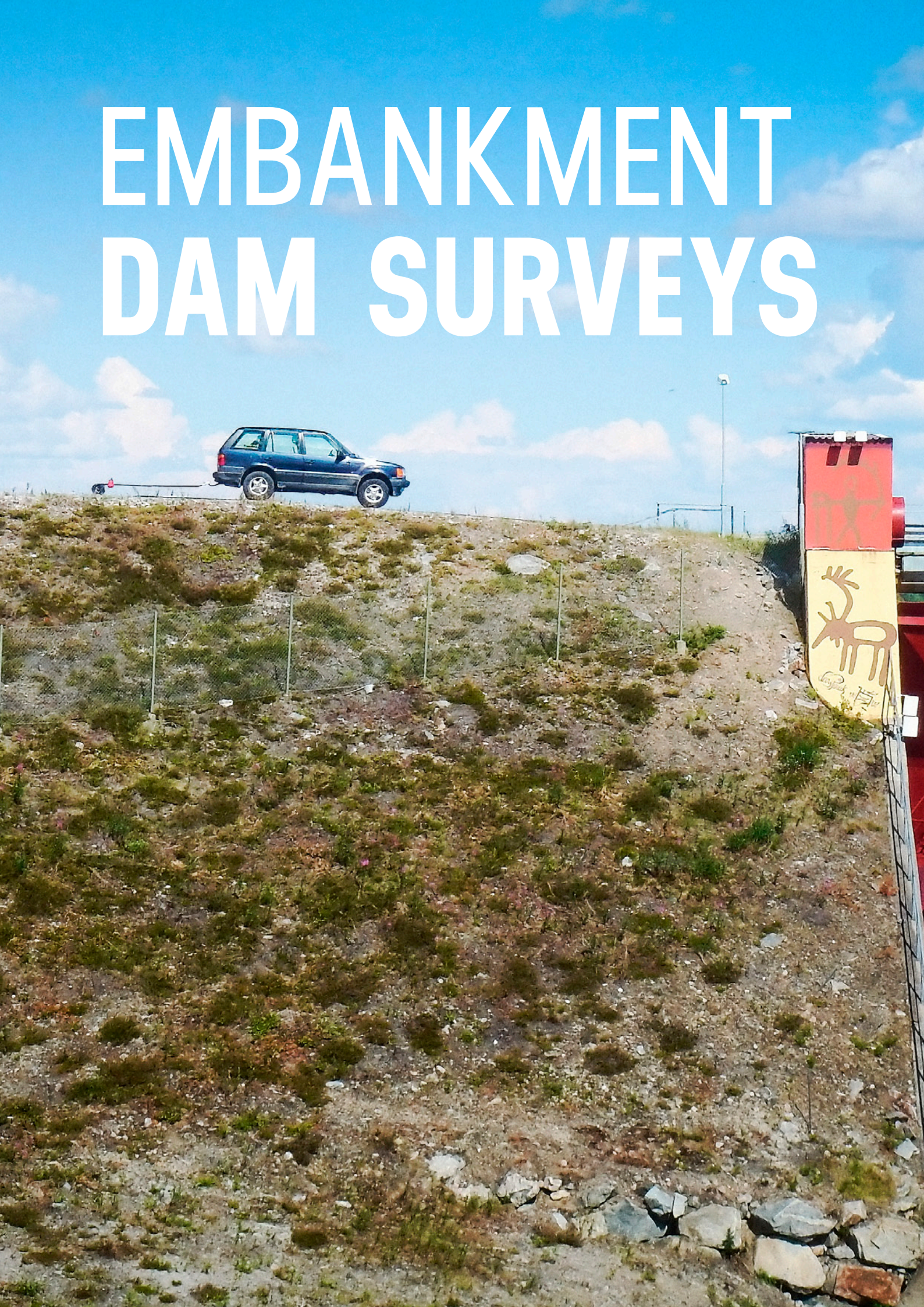


GROUNDWATER PROSPECTING DATA SAMPLE

1. Groundwater table
2. Aquiclude
3. Bedrock


RADAR 1
RANGE ROVER

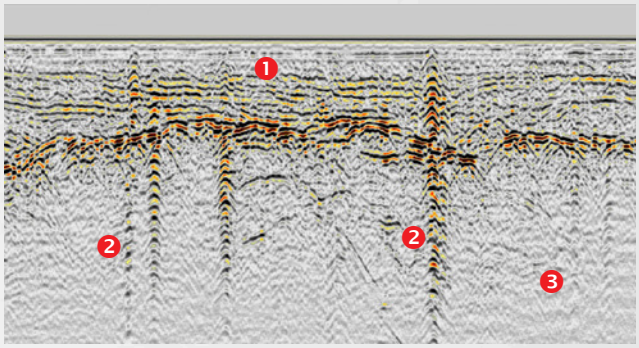
EMBANKMENT DAM SURVEYS



Safety control of earth embankment dams is a common application with the **COBRA PLUG-IN GPR**.

EMBANKMENT DAM SURVEY DATA SAMPLE

1. Dam core with voids
2. Fractured bedrock and voids above in dam core
3. Solid bedrock



HAZARDOUS VOIDS

The core of the dam is built up with compressed layers of impermeable soil. Hazardous voids, so called piping, can be detected with GPR.

The cause of these voids is often water filled fractures in the bedrock below the dam that sooner or later will erode the core.

To prevent further damages in the dam core these voids and cracks must be injected with dense material like bentonite and concrete.

The radargram above illustrates a 75 m long distance with fractured bedrock that has created voids in the core of the dam.

After injection the dam is re-surveyed to insure that injection has been successful and all voids disappeared.

COBRA PLUG-IN GPR – TECHNICAL SPECIFICATIONS

COBRA PLUG-IN GPR UNIT	
Dynamic range	192 dB (32 bit)
Transmitter output	40 V
Time range	0-1,600 ns
Maximum depth range	120 m (RDP=4)
Sampling interval	3,125 ns (320 MHz)
PRF-rate	156 kHz
Stacking	32,000 stacks/s, 45 dB increased S/N-ratio
Power	Integrated 11.1 V/ 6.6 Ah, 73 Wh Li-Ion battery
Charger	Mascot 2241 3-cell Li-Ion
Operating time	16 hours continuous use
Mechanical	Size: 190 x 140 x 80 mm (L x W x H) Weight: 1 kg (including battery)

COBRA PLUG-IN CONTROL UNIT / CU	
Ultra Rugged PDA	Mesa Geo Notepad
Processor	806 MHz PXA320
Operating system	Windows Embedded Handheld 6.5 Pro
Memory and data Storage	256 MB RAM, 4 GB Flash
Display	5.7" High visibility backlit VGA LCD, (640x480 px resolution)
Keyboard	15 control buttons, 5 way navpad
Ports	RS-232, USBx2, 12 V DC, audio jack
Mechanical	Size: 136 x 220 x 51 mm (L x W x H) Weight: 1 kg (including two batteries)
Environmental	IP67 water-and dustproof, operating temperature: -20°C to 50°C, MIL-STD-810G approved
Power	Smart Li-Ion batteries, 38 Wh
Operating time	16 hours operating time
Wireless connections	Bluetooth 2.0+EDR (30 m range), WiFi 802.11b/g, Quad-band 3G GSM/GPRS/EDGE, data communication interface, SMS
Camera	3.2 MP resolution with autofocus, geotagging
GPS	Integrated real-time SBAS with 2-5 m typical accuracy

COBRA PLUG-IN ANTENNAS SUBECHO MODELS	Model SE-40	Model SE-70	Model SE-150
BW (10 dB), Bandwidth (MHz)	15-105 (90 MHz)	20-140 (120 MHz)	20-280 (260 MHz)
Center frequency@ξr=9(MHz)	52	80	124
BW/CF-ratio (%)	173	150	210
Vertical resolution@ξr=9(λ/4)	48 cm	31 cm	21 cm
Horizontal resolution @depth=λ	141 cm	88 cm	59 cm
Size (L x W x H)	200 x 15 x 21 cm	139 x 15 x 21 cm	92 x 22 x 22 cm
Weight (kg)	4.7	3.7	3.5