SENSYS®
Magnetometers & Survey Solutions

Setting up an UXO test site

@ SENSYS

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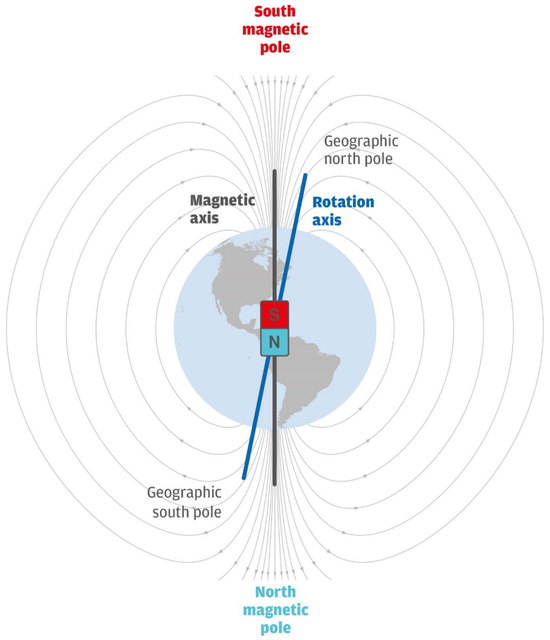
SENSYS in a nut shell



"The Fluxgate Magnetometer is our core sensor to be used in most of our survey solutions. Our products measure magnetic fields, which are either the Earth's Magnetic Field or local fields."

30+ YEARS OF KNOWLEDGE

Founded 1990.

30 min

East of Berlin.

We MAG

Focused!

Stable growth.

UXO Survey

ARCHeaology

GEOphysics

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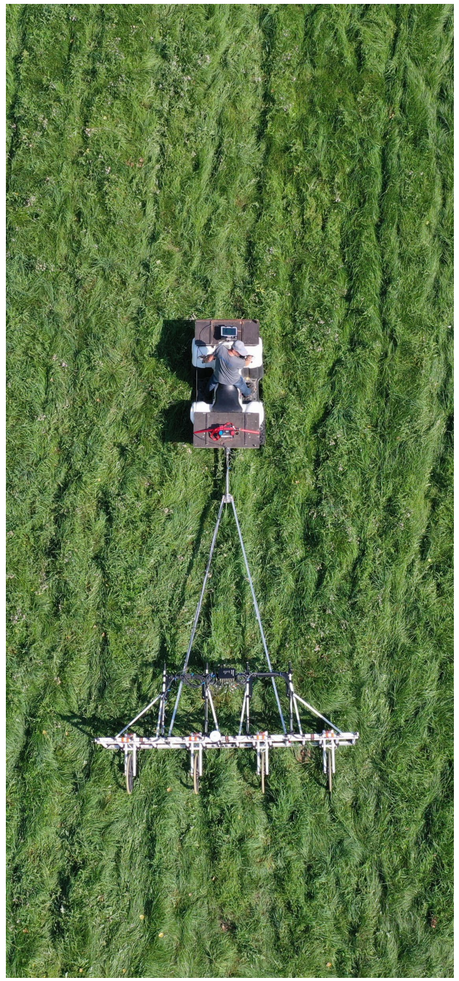
SENSYS in a nut shell

Aerial solutions

Direct-push systems

Handheld devices



Vehicle-towed systems

Submersible systems

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The purpose

No accessible UXO test site

- Only military operated inaccessible test sites
- Manufacturer own test spots for detector check
- Demand for a scientifically correct but also pragmatic test site

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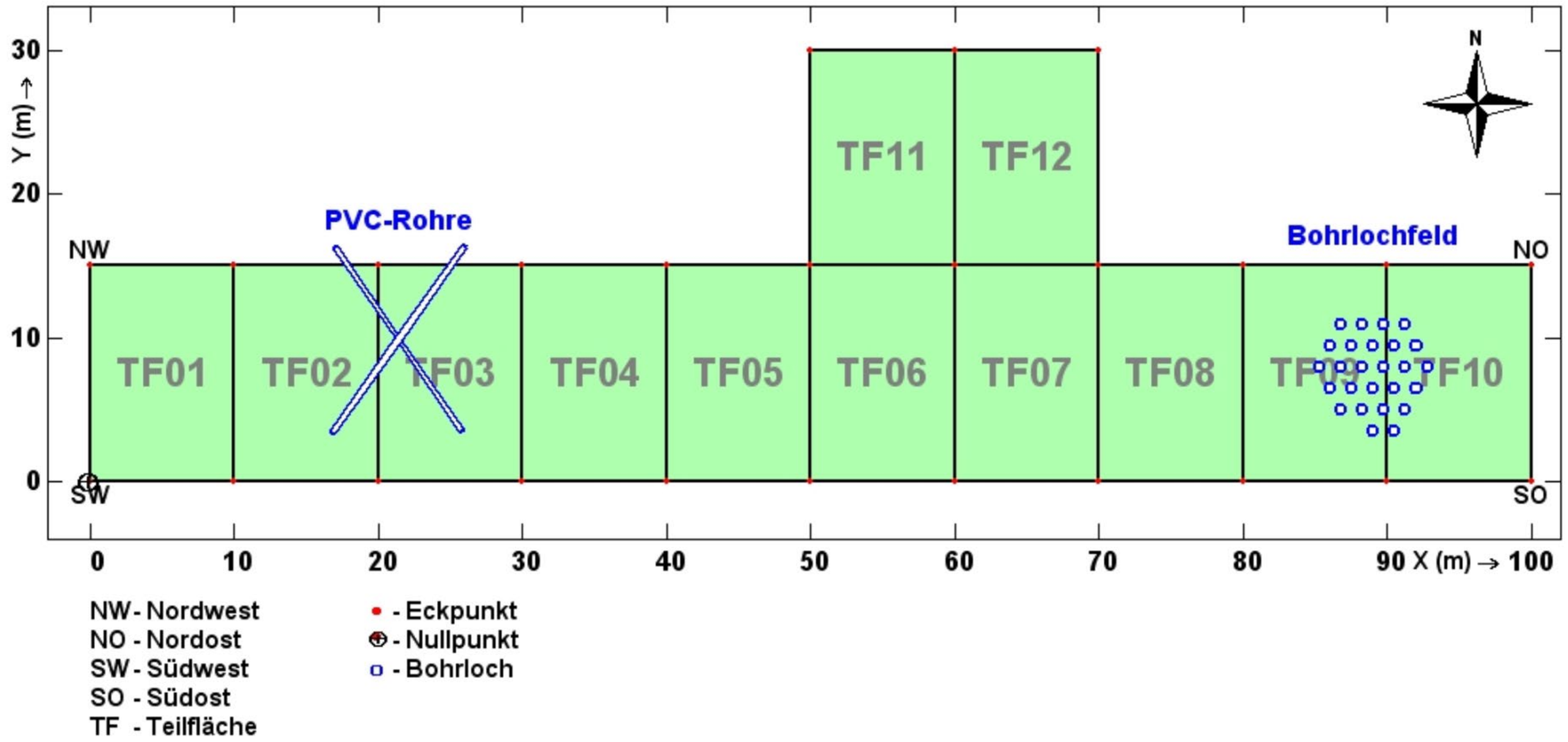
Concept GEOMIL Test site @ SENSYS

Back in 2003, the proving ground shall be used for the following **purposes**:

- R&D of SENSYS GmbH and R&D of third parties (on request).
- Evaluation of geophysical sensors and UXO / landmine detection systems by public-sector research institutions.
- Training of system operators of UXO clearance companies.
- Quality assurance and certification of UXO clearance staff / companies.

The test site GEOMIL (“GEOphysics and MILitary Contamination”) was developed in a cooperation between **SENSYS** and the Chair of Chemical Engineering and Hazardous Wastes of the Brandenburg **University of Technology at Cottbus, Prof. Wolfgang Spyra**.

Concept GEOMIL test site



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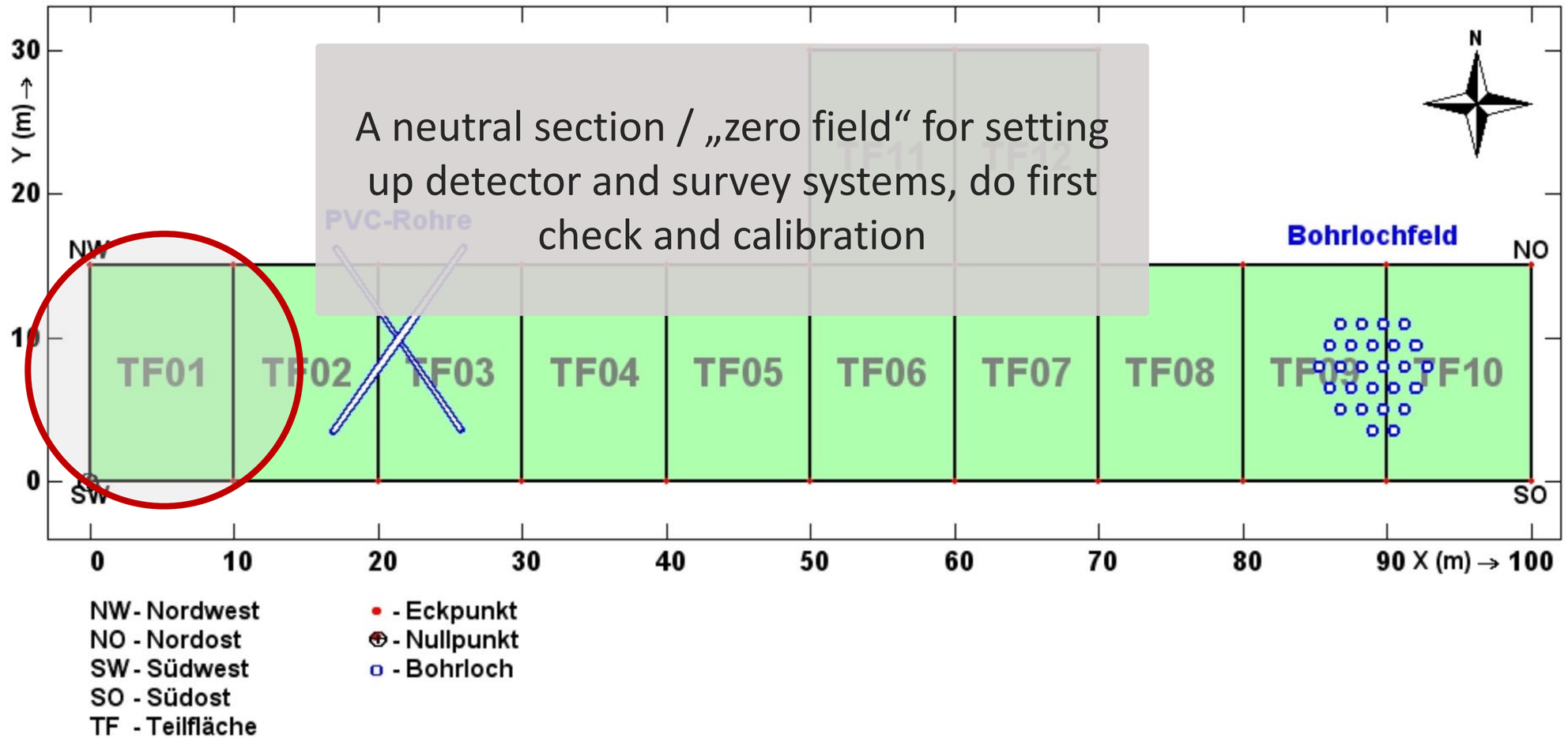
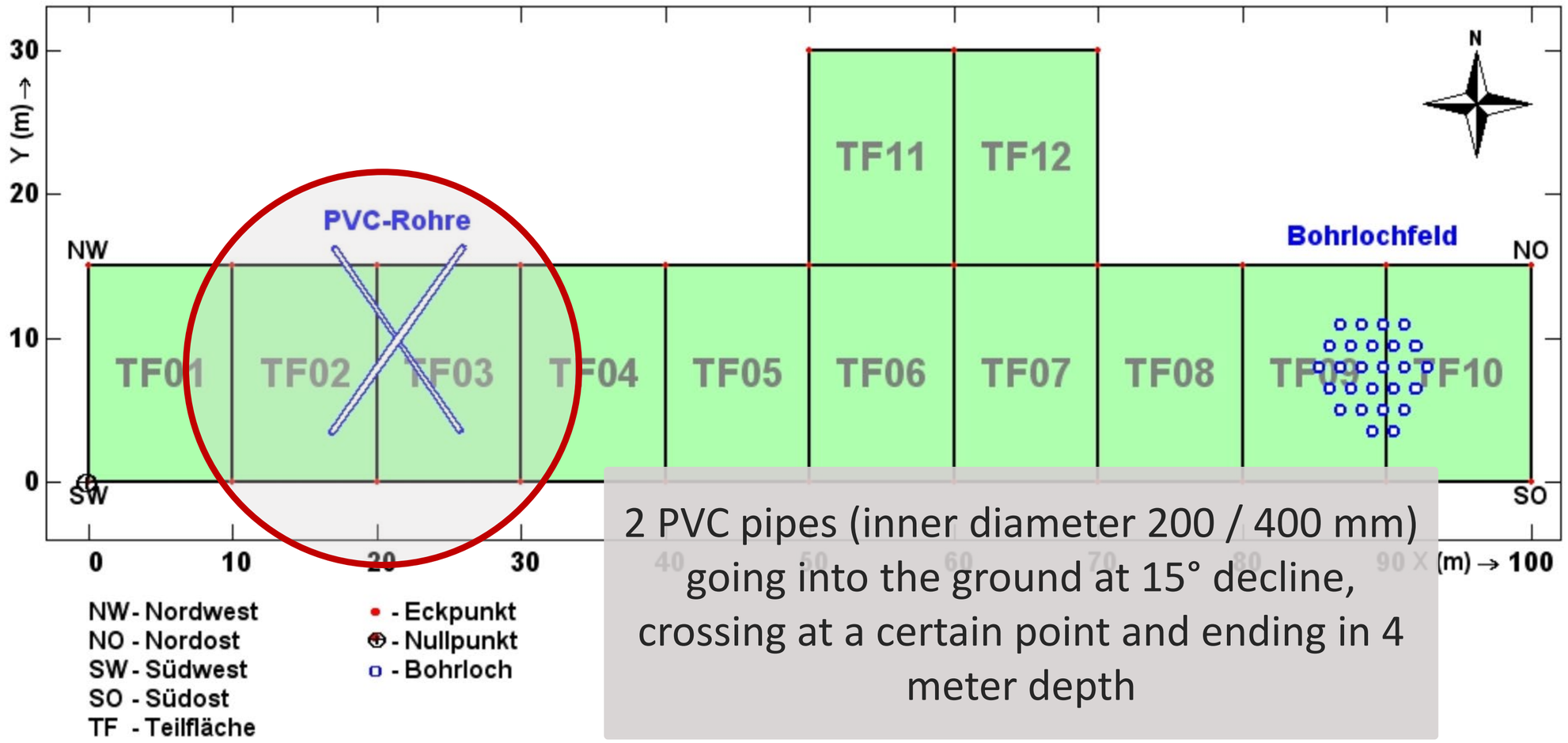
Concept GEOMIL test site – zero field



Concept GEOMIL test site – playground



2 PVC pipes (inner diameter 200 / 400 mm) going into the ground at 15° decline, crossing at a certain point and ending in 4 meter depth

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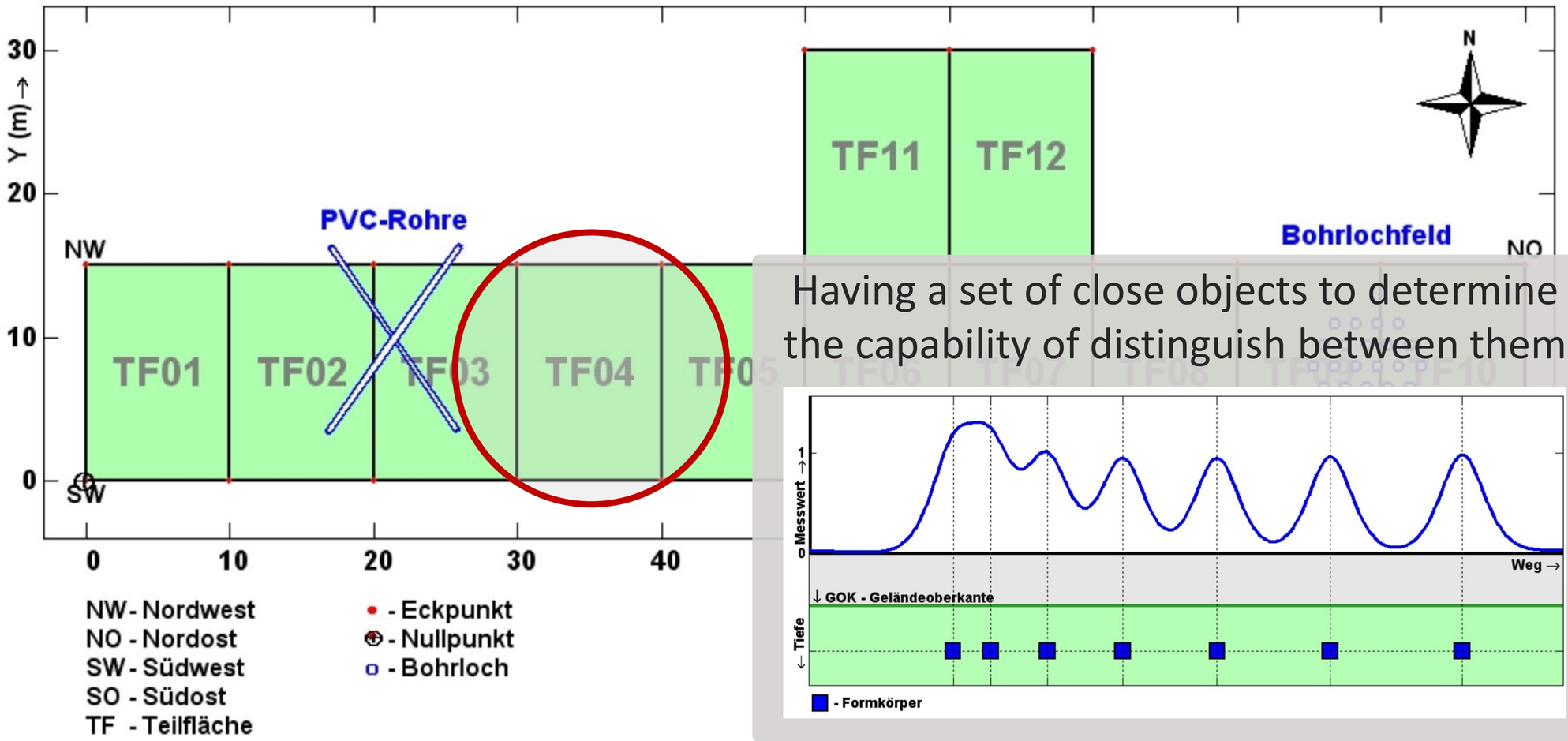
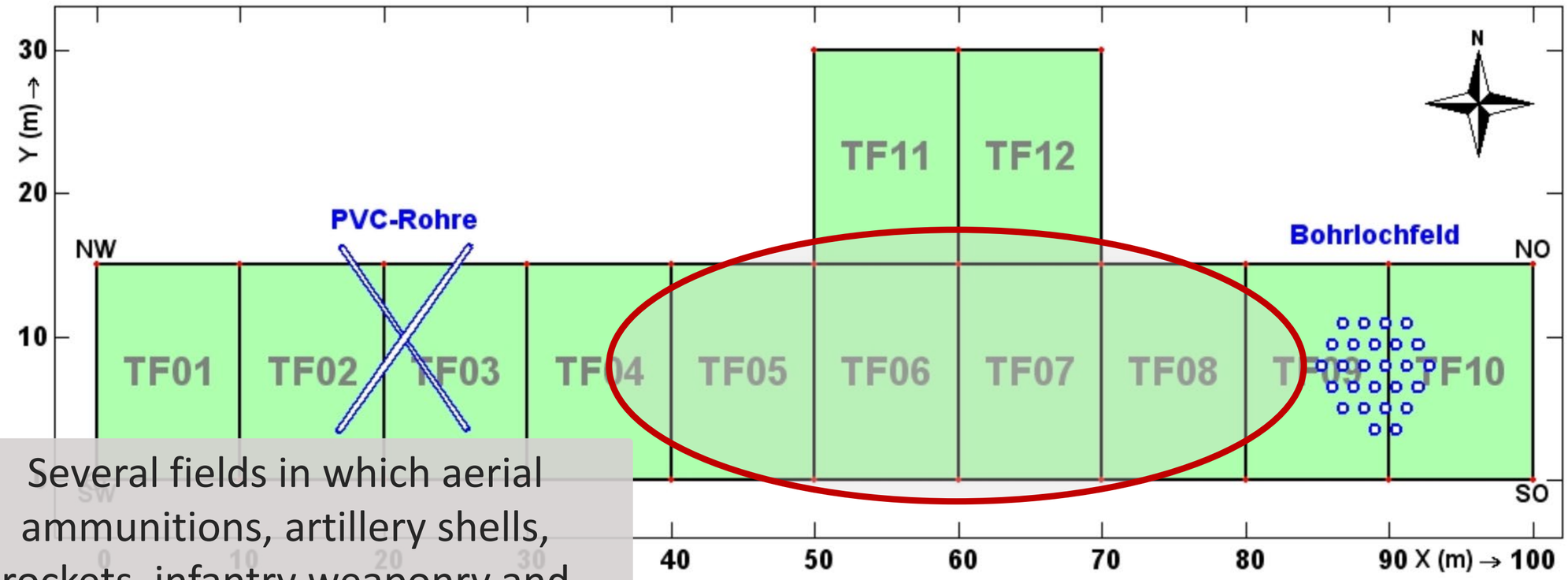
Concept GEOMIL test site – spatial resolution grid



Having a set of close objects to determine the capability of distinguish between them

Concept GEOMIL test site – variety of objects



Several fields in which aerial ammunitions, artillery shells, rockets, infantry weaponry and clutter are buried in patterns resembling usual find situations

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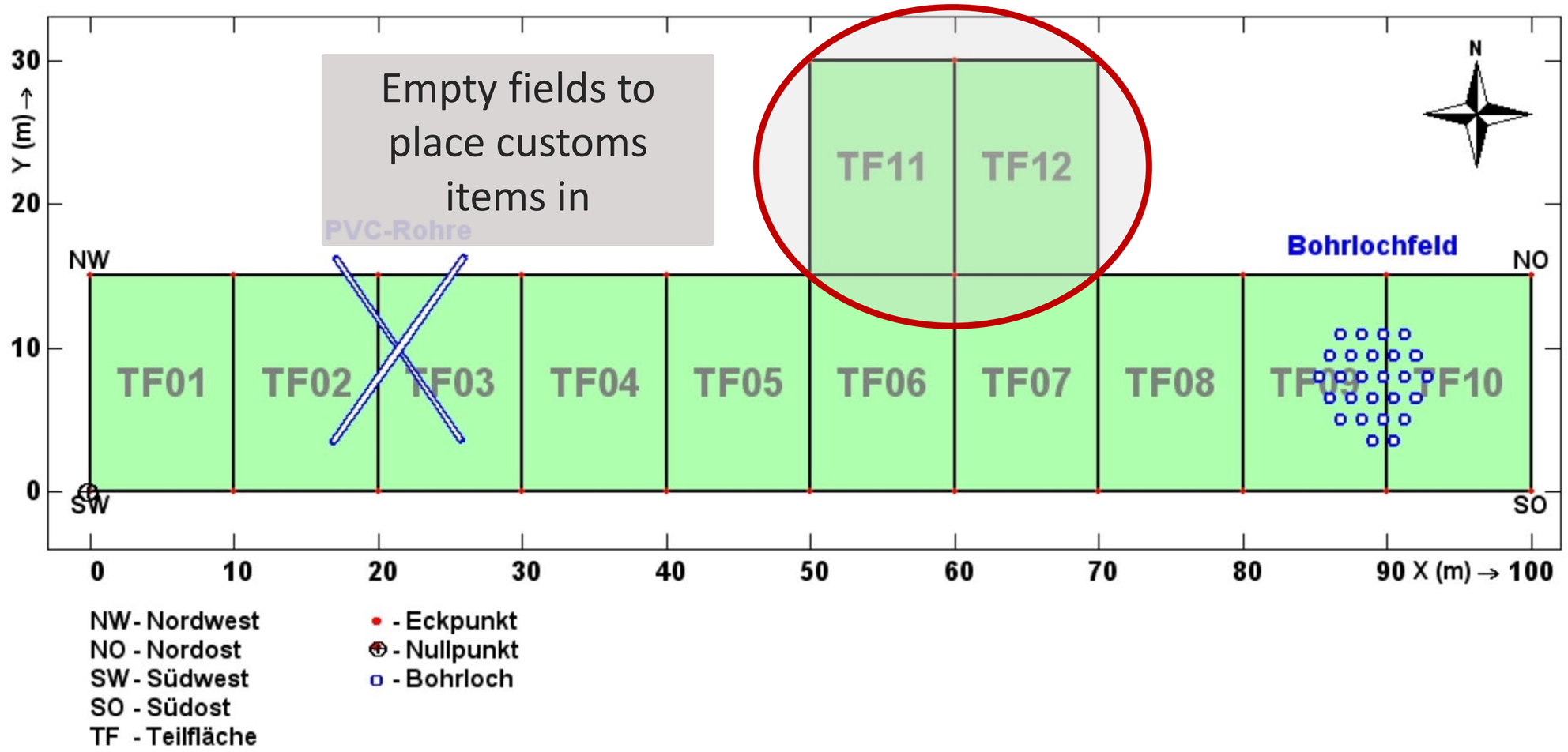
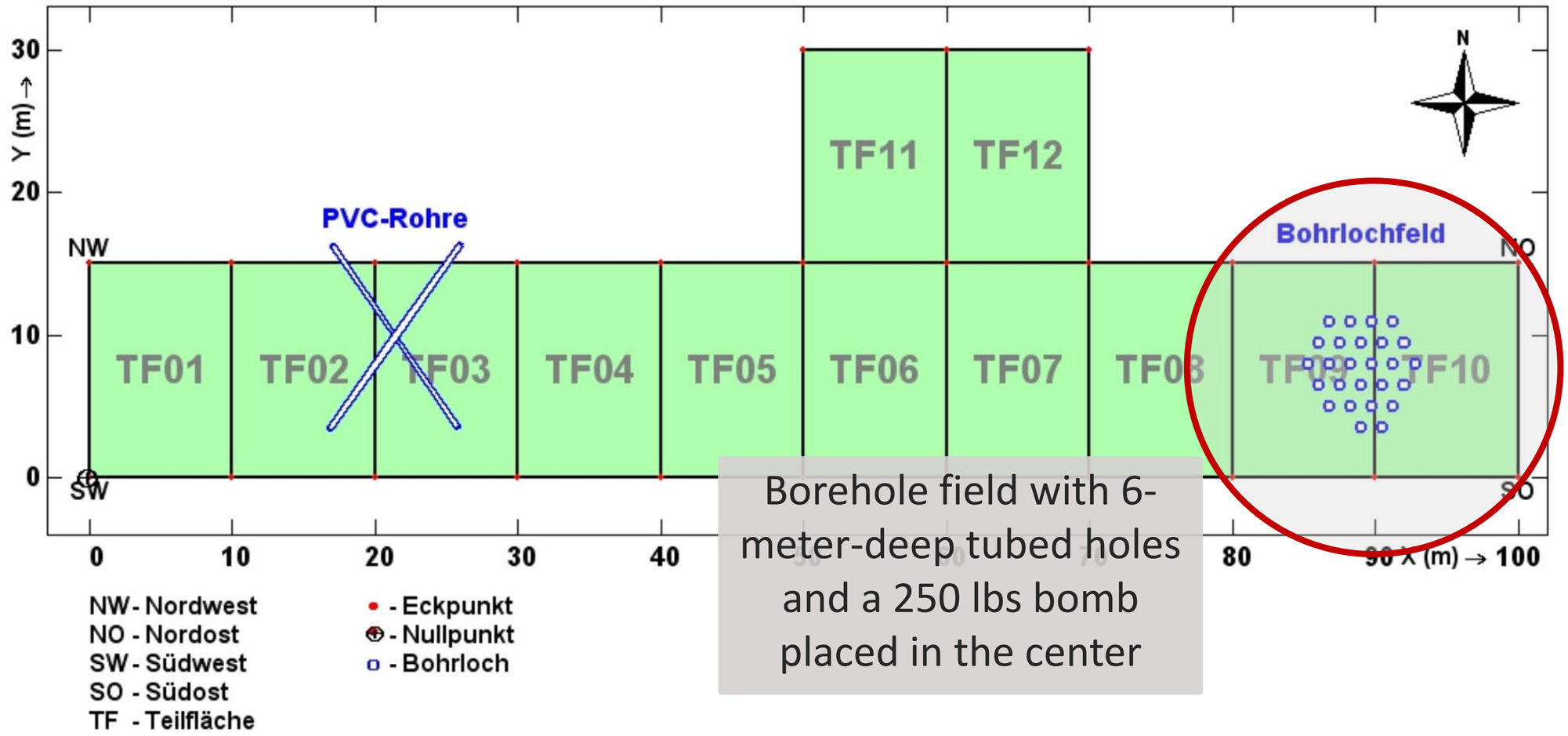
Concept GEOMIL test site – custom area



Concept GEOMIL test site – borehole field



Borehole field with 6-meter-deep tubed holes and a 250 lbs bomb placed in the center

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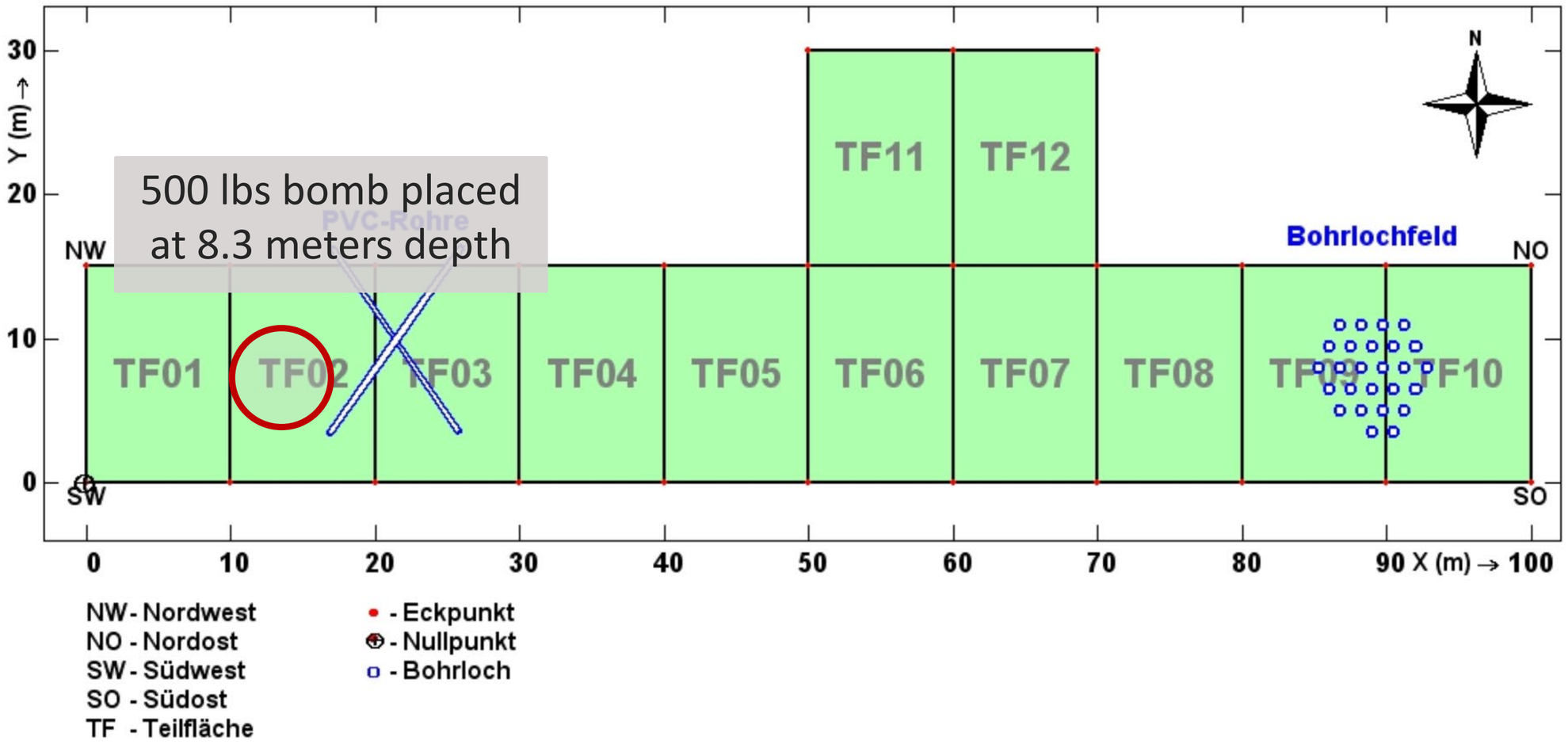
Concept GEOMIL test site – out of reach



Concept GEOMIL test site @ SENSYS

Site Investigation and core sampling

Site Object calibration

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Site Survey

Site Preparation

Site Object placement

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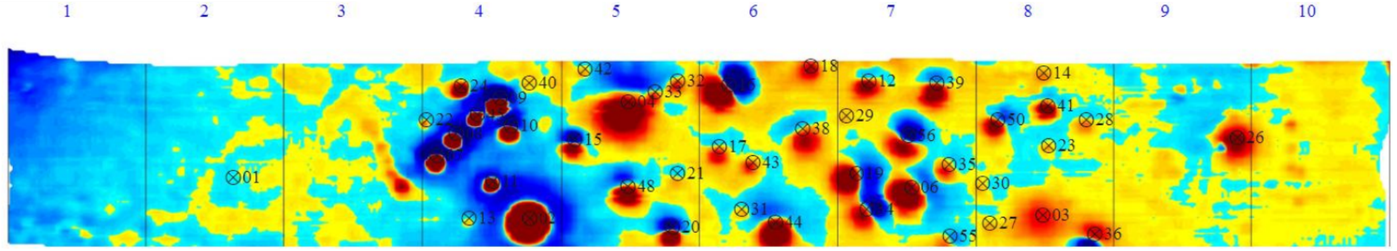
Site Operation since 20 years

Detektionsvergleich auf Grundlage eingebrachter Objekte im GEOMIL-Testfeld der SENSYS GmbH
Comparison of detection capabilities based on buried objects on GEOMIL test site at SENSYS GmbH

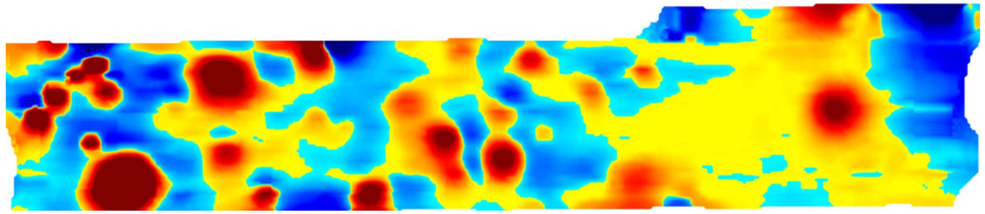
Nr.	Bezeichnung	Tiefe	Masse	Abmessung	Abmessung	Wanddicke	geometrische Form	Material	Mag. Moment	MagDrone R3 100cm sensor distance 1m AGL		MagDrone R4 50cm sensor distance 1m AGL		MagDrone R4 50cm sensor distance 0.5 AGL	
		[m]	[kg]	[mm]	[mm]	[mm]			(MXV3) [Am²]	sondiert	detektiert	sondiert	detektiert	sondiert	detektiert
No.	UXO Description	Burial depths	Mass	Diameter	Length	Wall thickness	Geometrical shape	Material	Mag. moment	surveyed	detected	surveyed	detected	surveyed	detected
		[m]	[kg]	[mm]	[mm]	[mm]			[Am²]			2024-09-04, 11-22-58.pmdf		2021-12-20, 10-12-40.pmdf	
1	GP 500	-8,3	94	D: 330	L: 1075	20	Zylinder	Stahlguss		1	0	0		0	
2	C 250	-1,5	28,5	D: 380	L: 1150	2-3	Zylinder	Stahlblech	11,8	1	1	1	1	1	1
3	MC 500	-3,6	108,5	D: 328	L: 930	25	Zylinder	Stahlguss	3,27	1	1	1	1	1	1
4	UK 31	von -2,5 bis -3,0	51,5	D: 309/150	L: 1770	Kopf:10;Rohr:5	Tropfenform, schlank	Stahl	17,35	1	1	1	1	1	1
5	Do.V 21	-1,5	79	D: 219/140	L: 1970	20; Spitze: 20-30	Zylinder, schlank	Stahlguss	2,62	1	1	1	1	1	1
7	TM 62 M (1)	-0,3	9,1	D: 310	H: 101	2-3	flacher Zylinder	Stahlblech	1,22	1	1	1	1	1	1
8	TM 62 M (2)	-0,3	9,2	D: 310	H: 101	2-3	flacher Zylinder	Stahlblech	0,63	1	1	1	1	1	1
9	TM 62 M (3)	-0,3	9,4	D: 310	H: 101	2-3	flacher Zylinder	Stahlblech	0,34	1	1	1	1	1	1
10	TM 62 M (4)	-0,3	10,7	D: 310	H: 101	2-3	flacher Zylinder	Stahlblech	0,06	1	1	1	1	1	1
11	Springmine OSD	-0,3	4,7	D: 85	H: 150	4-5	Zylinder, schlank	Stahl	0,3	1	1	1	1	1	1
12	PG 2	-0,7	1,5	D: 80	L: 500	4	Tropfenform, schlank	Stahlblech	0,23	1	0	0		1	1
13	PG 7	-0,6	1,3	D: 65	L: 660	1-3	Tropfenform, schlank	Stahlblech	0,05	1	0	1	0	1	0
14	PG 9/15	-0,7	1,7	D: 73	L: 920	1-3	Tropfenform, schlank	Stahlblech	0,14	0		0		0	
15	RPG - 18	-0,4	2,6	D: 70	L: 760	1-4	Tropfenform, schlank	Stahlblech, Alu	0,32	1	0	1	0	1	1
16	Panzerfaust 100 (K1 u. R1)	-0,9	1,1+ 2,9	D: 150/50	L: 1100	Kopf:1-2;Rohr:3	Tropfenform, schlank	Stahlblech	2,77	1	1	1	1	1	1
17	Panzerfaust 100 (K2)	-0,8	1,2	D: 150	L: 340	Kopf: 1-2	Tropfenform	Stahlblech	0,26	1	0	1	1	1	1
18	Panzerfaust 100 (K3)	-0,8	1,1	D: 150	L: 340	Kopf: 1-2	Tropfenform	Stahlblech	0,6	1	1	1	1	1	1
19	Panzerfaust 100 (R3)	von -1,0 bis -1,4	2,8	D: 50	L: 800	Rohr: 3	Zylinder, schlank	Stahl	3,36	1	1	1	1	1	1
20	Sprenggranate 7,62 cm	-0,45	6	D: 76	L: 300	min. 5	Ogive, schlank	Grauguss	0,13	1	1	1	1	1	1
21	Panzergranate 4,5 cm	-0,6	1,2	D: 45	L: 130	8-9	Zylinder, schlank	Stahl	0,03	1	0	1	0	1	1
22	Handgranate F 1	-0,3	0,3	D: 55	L: 85	2-7	eiförmig	Stahlguss	0,01	1	0	1	0	1	0
23	Handgranate RGD-5	-0,5	0,3	D: 53	L: 76	3-4	eiförmig	Stahlblech, mehrtlagig	0,08	1	0	1	0	1	1
24	Stahlhelm (stark gerostet)	-0,4	0,8	D: 230	H: 160	1-2	Halbkugel	Stahl	0,29	1	0	1	0	1	1
26	Splitterbombe - SD 70 (2)	-2,5	20	D: 200	L: 660	2;Spitze:voll	Zylinder, schlank	Presstahl	7,79	1	1	0		1	1
27	Panzergranate 5 cm (Nr.3)	-0,7	1,7	D: 50	L: 135	15-voll	Ogive	Stahl	0,04	1	0	1	1	1	0
28	Panzergranate 5 cm (Nr.4)	-0,65	1,8	D: 50	L: 162	8-voll	Zylinder, schlank	Stahl	0,01	1	0	1	0	0	
29	Panzergranate 4,5 cm (Nr. 5)	-0,7	1,2	D:45	L: 130	10-voll	Ogive; schlank	Stahl	0,01	1	0	1	0	1	0
30	Panzergranate 4,5 cm (Nr. 6)	-0,65	1,2	D:45	L: 130	10-voll	Ogive; schlank	Stahl	0,06	1	0	1	0	1	1
31	Panzergranate 4,5 cm (Nr. 7)	-0,6	1,1	D:45	L: 140	10-voll	Ogive; schlank	Stahl	0,03	1	0	1	0	1	0
32	Sprenggranate 7,5 cm (Nr.8)	-0,7	4,2	D: 75	L: 250	7-8	Zylinder, schlank	Stahl	0,07	1	0	1	0	1	1
33	Sprenggranate 7,5 cm (Nr.9)	-0,6	4,2	D: 75	L: 250	7-8	Zylinder, schlank	Stahl	0,35	1	0	0		1	1
34	Panzerfaust 100 (R2)	v. -0,90 bis -0,95	2,8	D: 50	L: 800	Rohr: 3	Zylinder, schlank	Stahl	1,5	1	0	1	1	1	1
35	Panzergranate 8,8 cm (Nr.10)	-0,9	8	D: 88	L: 230	25-28; voll	Ogive	Stahl	0,45	1	0	1	0	1	1
36	Panzergranate 8,8 cm (Nr.11)	-1	7,6	D: 88	L: 225	25-28; voll	Ogive	Stahl	1,23	1	1	0		1	1
38	Sprenggranate 15 cm (Nr.13)	-1,3	34	D: 150	L: 580	8-10	Zylinder, schlank	Stahl	0,68	1	1	1	1	1	1
39	HL Granate 125 mm	-0,9	15	D: 125	L: 630	Kopf: 10; 15	Tropfenform, schlank	Stahl	0,22	1	1	0		0	
40	Panzergrane 23 mm	-0,1	0,2	D: 23	L: 63	voll	Tropfenform	Stahl	0,01	0		1	0	1	1
41	Granatsplitter (Nr.1)	-0,6	1,5	B: 110	L: 180	20		Stahl	0,12	1	1	1	1	0	
42	Granatsplitter (Nr.2)	-0,45	2	B: 80	L: 110	20		Stahl	0,02	1	0	1	0	1	0
43	Granatsplitter Leitwerk	-0,6	1,1	D: 120	L:165	10		Stahl	0,1	1	0	1	0	1	1
44	Do-Werferkopf 32 cm	-1,3	14	D: 320	L: 800	3-4	eiförmig	Stahl	2,54	1	1	1	1	1	1
45	Stahlhelm	-0,2	1,2	D: 230	H: 160	1-2	Halbkugel	Stahl	0,68	1	1	1	1	1	1
46	Sprenggranate 122 mm	-0,9	14,5	D: 120	L: 480	15	Ogive; schlank	Stahl	0,2	1	1	1	1	1	1
50	"Zylinder"	-0,75	3	D: 80	L: 400	5	Zylinder; schlank	Stahl	0,4	1	1	1	1	1	1
55	Patronengurt für 7,62 mm	-0,8	0,2	B: 34	L: 515	0,5		Stahlblech	1,62	0		0		1	1
56	Patronengurt für 14,5 mm	-0,95	0,3	B: 70	L: 420	0,5		Stahlblech	1,79	1	0	1	1	1	1

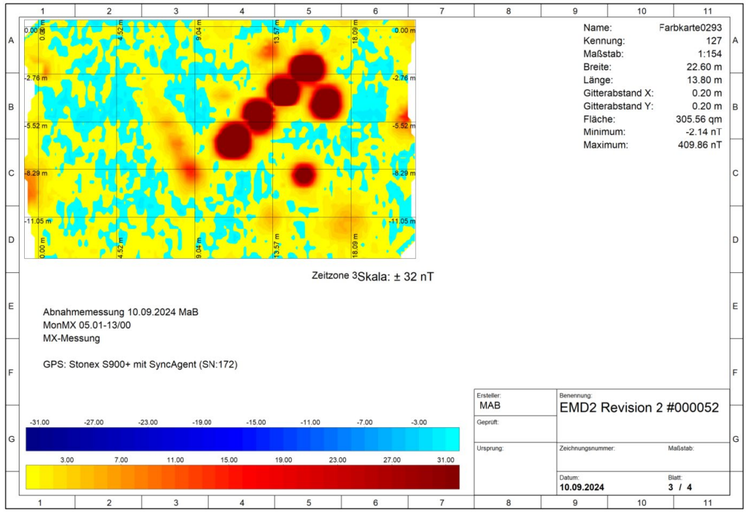
Grafische Übersicht der eingebrachten Objekte
Color coded map generated with vehicle towed system **MX V3** of detected buried objects

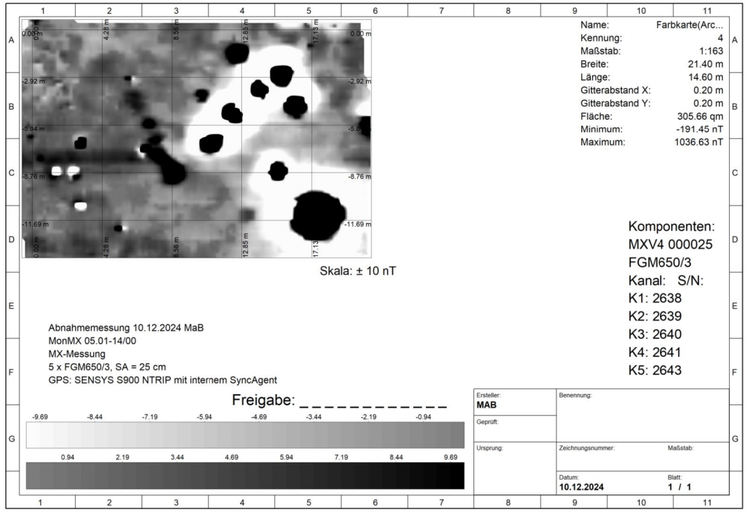


Color coded map generated with drone carried system **MagDrone R4** of detected buried objects

MagDrone R4
AGL 0.5m
flight speed 3m/s
Flight duration: 3 min
6 tracks with a distance of 2.5m







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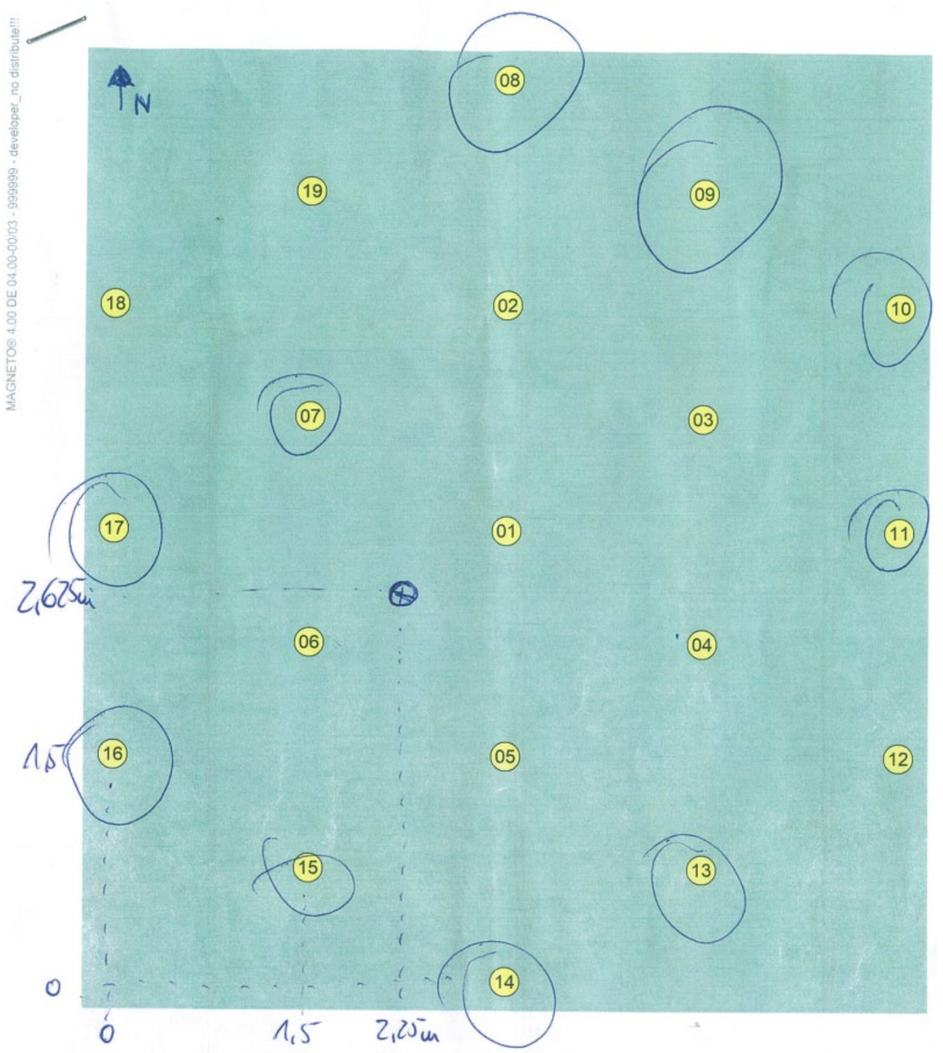
Site Extension with new 17 m borehole field



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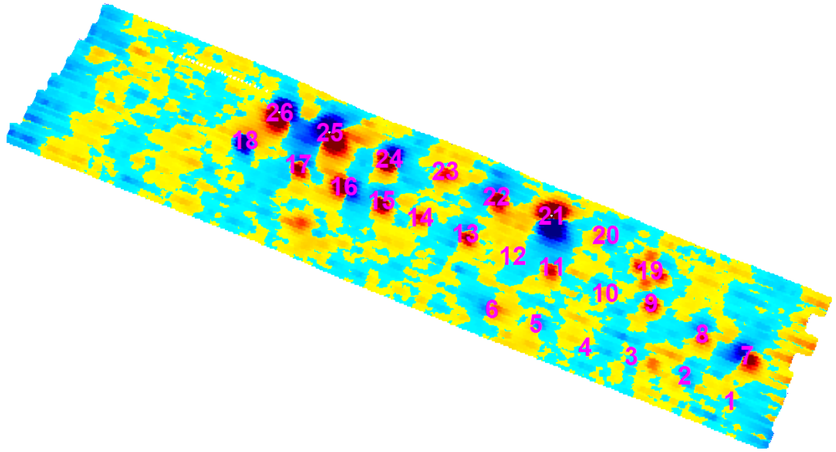
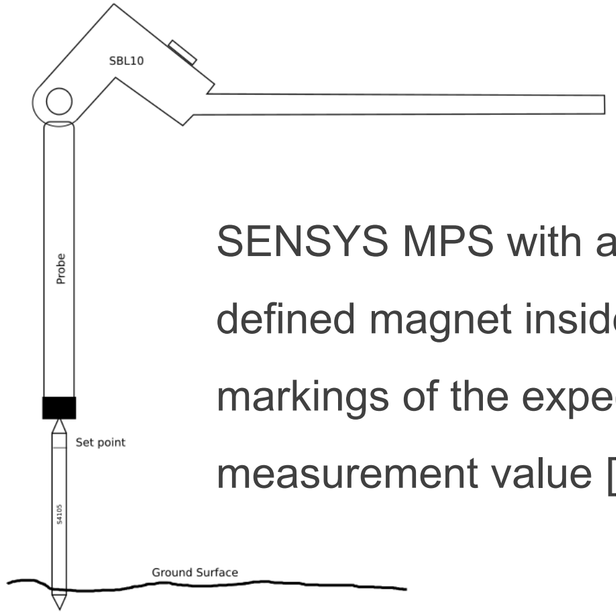
External UXO testing @ Ruppiner Heide



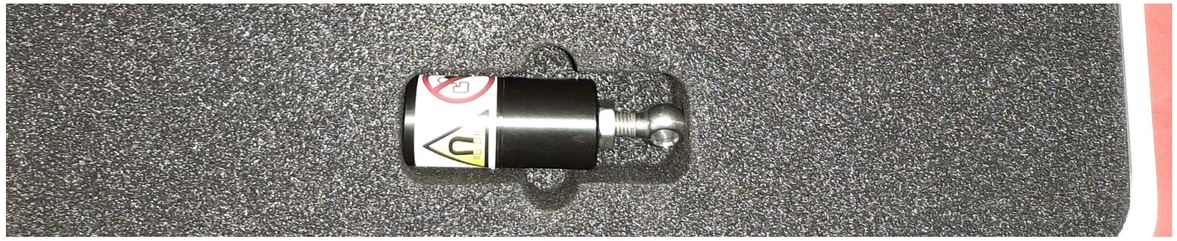
Nr.	Name	X [m]	Y [m]	Tiefe [m]	Magn.Moment [Am²]
1	30mm Hülse	-4.39	5.72	1.11	0.14
2	23mm Geschoss	-9.91	8.75	1.28	0.24
3	Ringe AO!	-16.35	11.06		
4	30mm + 12,7mm Patronen	-21.91	12.27	0.84	0.02
5	Splitter	-27.86	14.99	1.06	0.16
6	Splitter groß	-33.15	16.74	1.15	0.32
7	TM62	-2.38	11.24	1.17	1.21
8	Leuchtsatz 122mm Granate	-7.79	13.82	1.09	0.38
9	Treibladung 125 Granate	-13.88	17.54	1.20	0.57
10	57mm Granata	-19.50	18.72	1.34	0.15
11	Starttreibsatz	-25.88	21.86	1.15	0.47
12	Splitterköpfe S5	-30.62	23.19	0.95	0.03
13	Kopfteil 120mm Leuchtmörser	-36.33	25.85	1.09	0.64
14	122mm Granate	-41.73	27.82	1.28	0.40
15	125mm Übungsgranate	-46.46	29.91	1.12	1.17
16	122mm Leuchtgranate	-50.97	31.52	1.22	1.84
17	152mm Granate	-56.45	34.25	1.09	0.79
18	122mm Teil Ausstoßgeschoss	-62.83	37.14	1.15	1.22
19	Draht	-14.12	21.38		
20	PzAbwLfk Falanga	-19.39	25.67	1.08	0.22
21	122mm Hülle Leuchtgeschoss	-25.86	28.02	1.01	5.53
22	S8 Raketentriebwerk und Hülle Leuchtrakete	-32.52	30.35	1.17	1.17
23	Teile S5 Rakete	-38.71	33.41	1.42	0.66
24	Triebwerk 122mm Rakete	-45.45	34.92	1.07	1.69
25	Teil PG 9	-52.66	38.02	1.25	6.01
26	Teil PG 7	-58.65	40.51	1.05	3.20

3 rows with test pieces: small munition & fragments, granades, launchers, rockets

Test pieces for in-situ testing

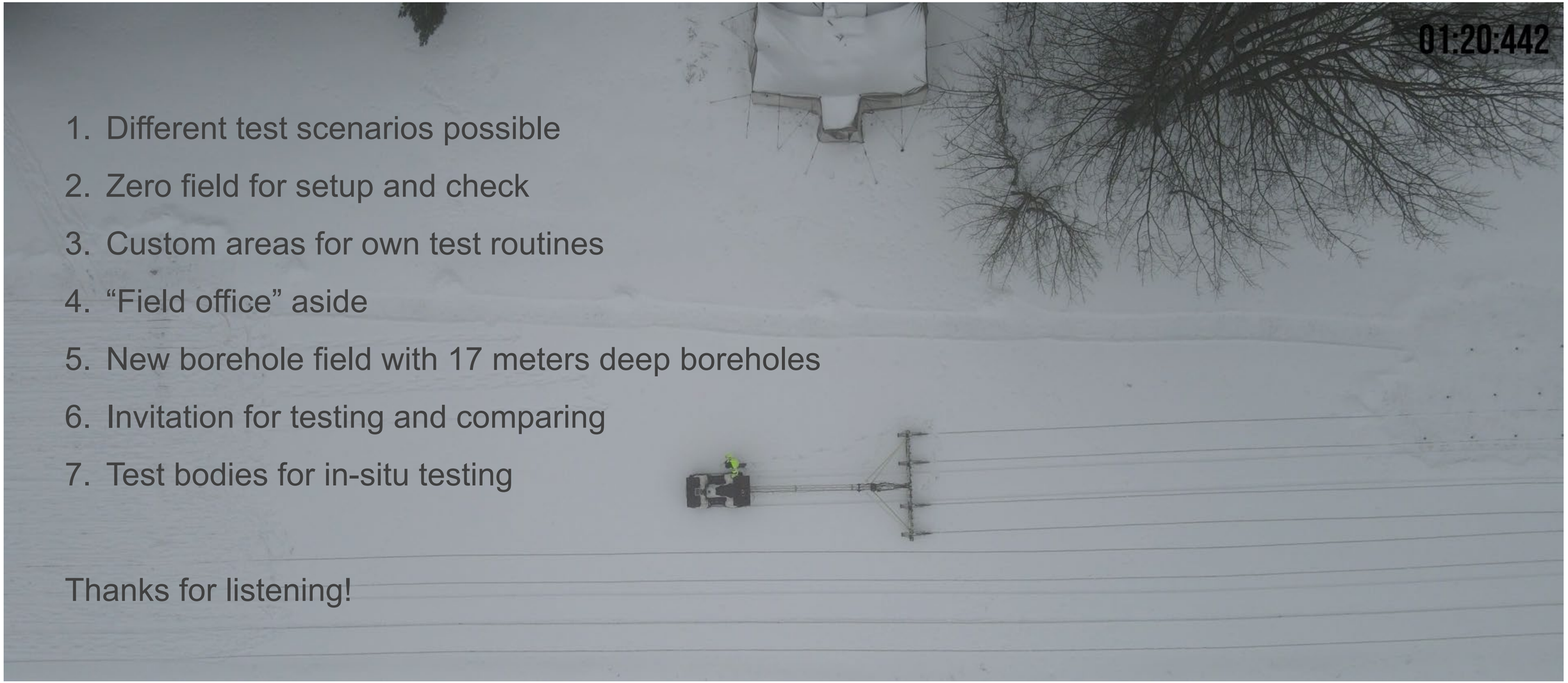


SENSYS MPS with a defined magnet inside and markings of the expected measurement value [in nT]



SENSYS test bodies with a defined magnet inside and a certificate stating the calibrated magnetic moment.

SumUp Well established test site



1. Different test scenarios possible
2. Zero field for setup and check
3. Custom areas for own test routines
4. “Field office” aside
5. New borehole field with 17 meters deep boreholes
6. Invitation for testing and comparing
7. Test bodies for in-situ testing

Thanks for listening!

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