



# Development of UXO clearance offshore and SeaTerra`s 2024 clearance campaign within the German “Sofortprogramm”



Dieter Guldin, COO  
SEATERRA GmbH  
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# Zentrale Meldestelle, Cuxhaven

## Onshore

1.4 mio. tons have been dropped in Germany during WW2. **5-20% are potential UXO**

Estimated **100.000t** are still not found yet.

1,4 mio.t.  
100.000t not cleared yet

**= 7,14% left in place**

## Offshore

1.6 mio. tons have been dumped in Germany during WW2. **100% are UXO**

**1.6 mio. Tons not cleared yet**

1,6 mio.t.  
31.753t cleared (in case every target would have been a 1000 lbs bomb)

**= 98,02% left in place**





## Onshore

Employees at the several mine clearance centre in Germany, responsible for UXO clearance and administrative work: **≈ 500 (§20)**

§20 personnel within the industry for UXO clearance operations: **2500** (no official numbers available)  
(Bund Deutscher Feuerwerker: 1.300 Mitglieder am 12.03.2022)

Specialised German UXO clearance companies on the market: **≈ 80-100**

## Offshore

Employees at the coastal mine clearance centre in Germany, responsible for UXO clearance work: **≈ 10 (§20)?**

§20 personnel within the industry for UXO clearance operations: **≈ 100**

Specialised German UXO clearance companies on the market: **≈ 5**



# start of UXO clearance. onshore versus offshore

Since unexploded ordnance was a huge challenge for the process of reconstruction of cities, infrastructure and industry, after WWII, the process of clearance started already during the war. Guidelines for survey and clearance operations, standards, methods and procedures have been developed further, ever since.

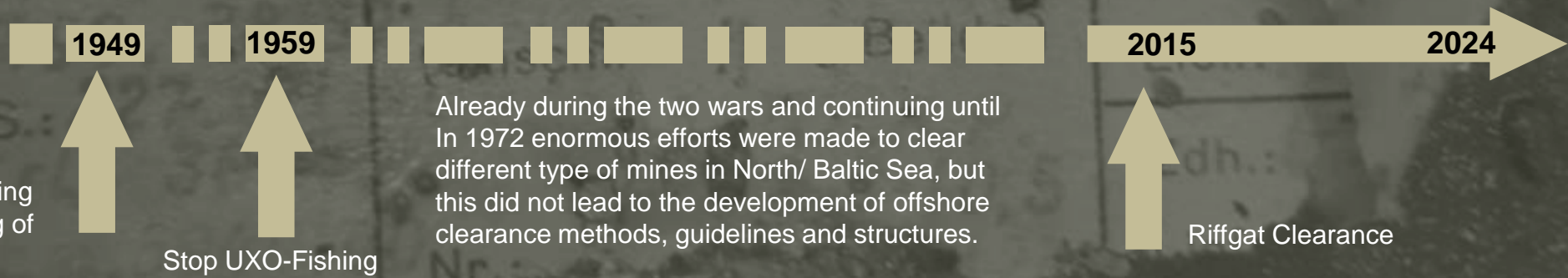
## Onshore Clearance



Start of UXO clearance

## Offshore Clearance

Since the problem of dumped UXO's in the sea has been no problem by the means of rebuilding the infrastructure or reconstruction, hardly any guideline or governmental structure has been developed to address the issue.



UXO-Fishing  
(Recycling of metal)

Stop UXO-Fishing

Already during the two wars and continuing until In 1972 enormous efforts were made to clear different type of mines in North/ Baltic Sea, but this did not lead to the development of offshore clearance methods, guidelines and structures.

Riffgat Clearance





## Reasons for UXO clearance offshore

war

safety of  
navigation

“no problem”

safety of infrastructure

safety of  
infrastructure

Environment

1959

2015

2022



**90%**

of all clearance operations takes place within the framework of new build infrastructure.

UXO survey and clearance installation for newbuild infrastructure with focus on renewable energy.

Only 4% of all targets are UXO`s

**8%**

of all clearance operations takes place within the framework of already existing infrastructure or nearshore projects

Harbours, Shipping lanes, NLG terminals, ...

6% - 40% of all targets are UXO

**2%**

of all clearance operations take place on dumping areas

Dumping areas like "Minsener Oog", "Pelzerhaken", "Haffkrug"

97% of all targets are UXO`s



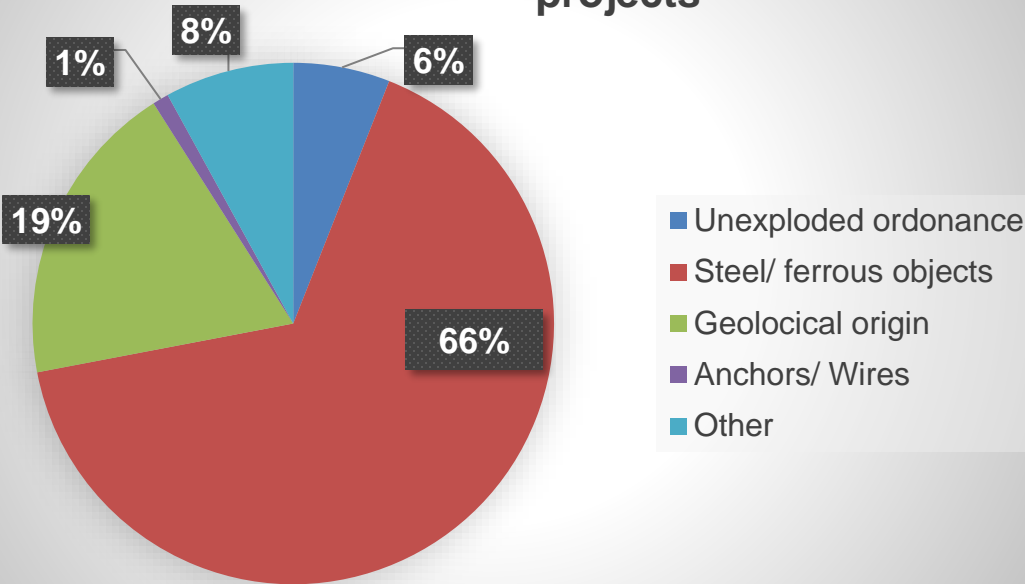


# ratio between scrap metal and UXO`s depending on the clearance area?

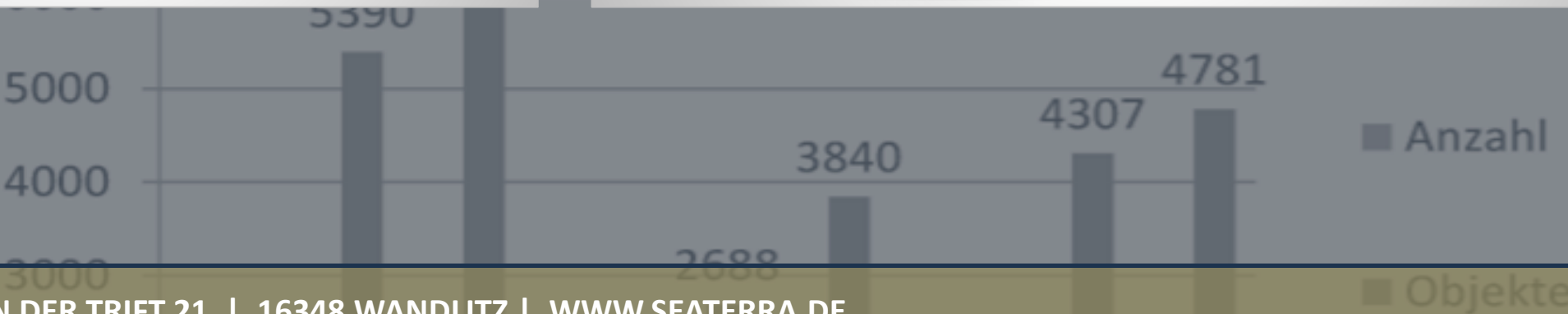
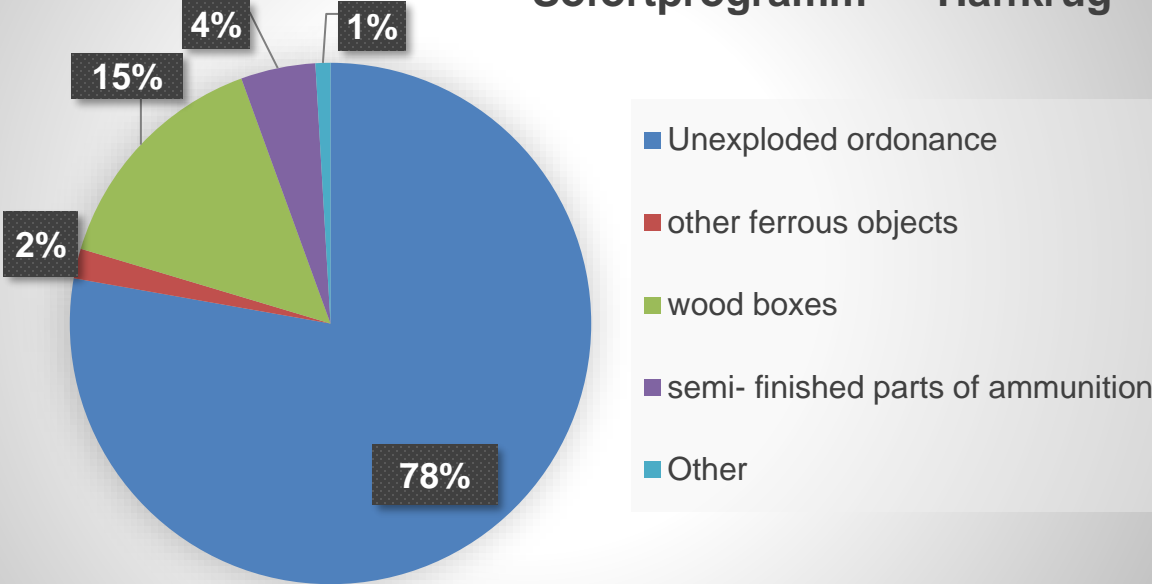
BLANO Expertenkreis

Anzahl gemeldeter Ereignisse

Clearance output infrastructure/ offshore projects



Clearance output at the so called "Sofortprogramm" – Haffkrug



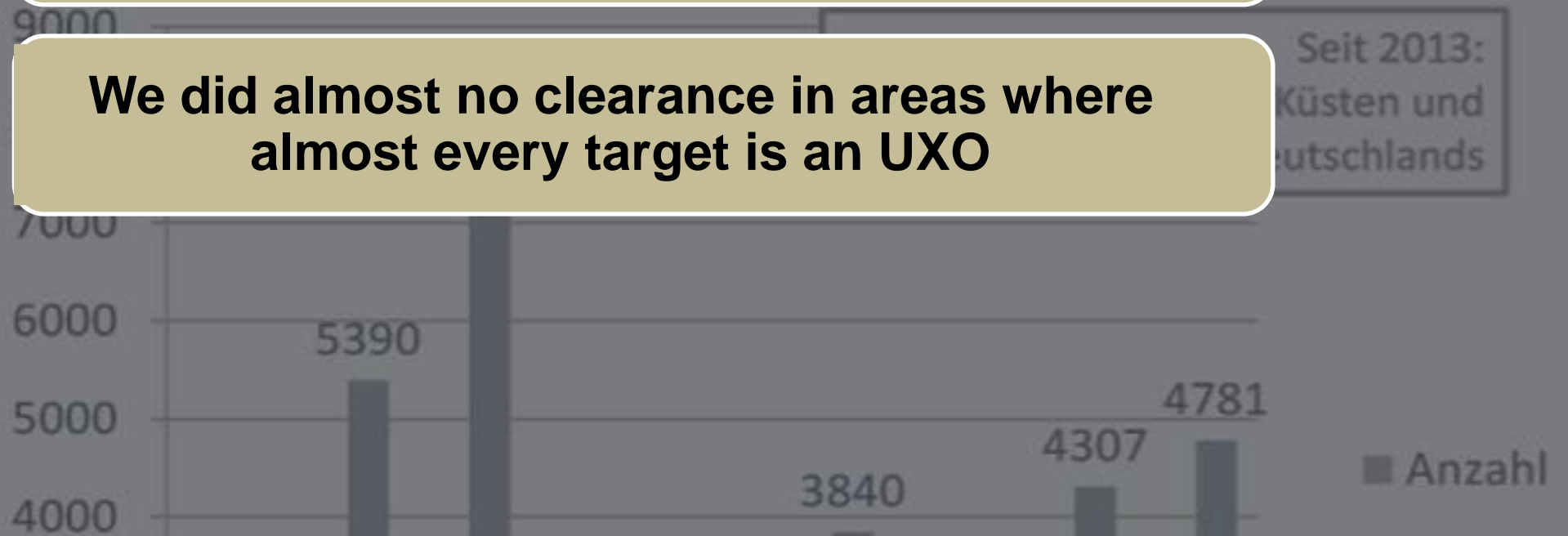


BLANO Expertenkreis  
Munition im Meer



**We did 90% clearance operations in areas,  
where there are less UXO's**

**We did almost no clearance in areas where  
almost every target is an UXO**



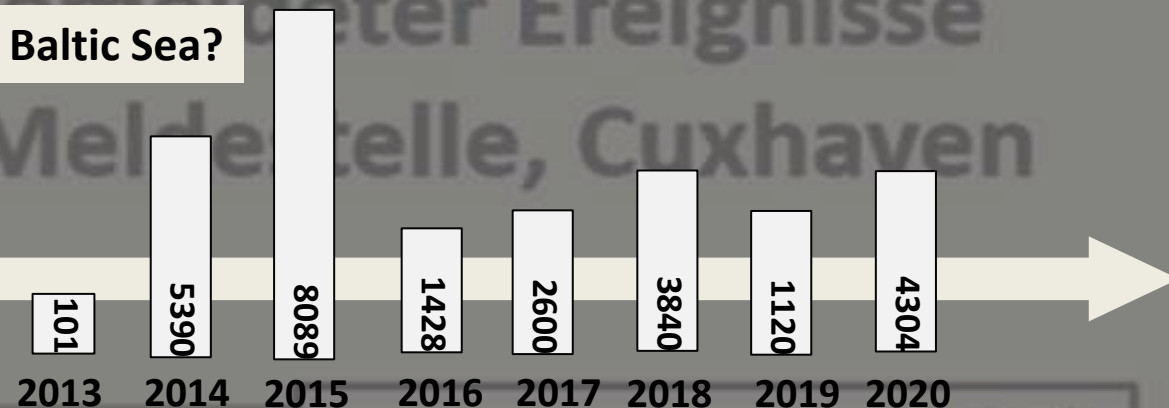




How long will it take to clear 1.6mio tons in North Sea/ Baltic Sea?

Amount of offshore UXO targets reported to the authorities

2013	101
2014	5.390
2015	8.089
2016	1.428
2017	2.600
2018	3.840
2019	1.120
2020	4.304



$26.912 \text{ objects} \times 500\text{Kg (1000lbs)} = 13.456.000\text{kg}$   
(13.456t)

13.456t within 8 years = 1.682t/ year

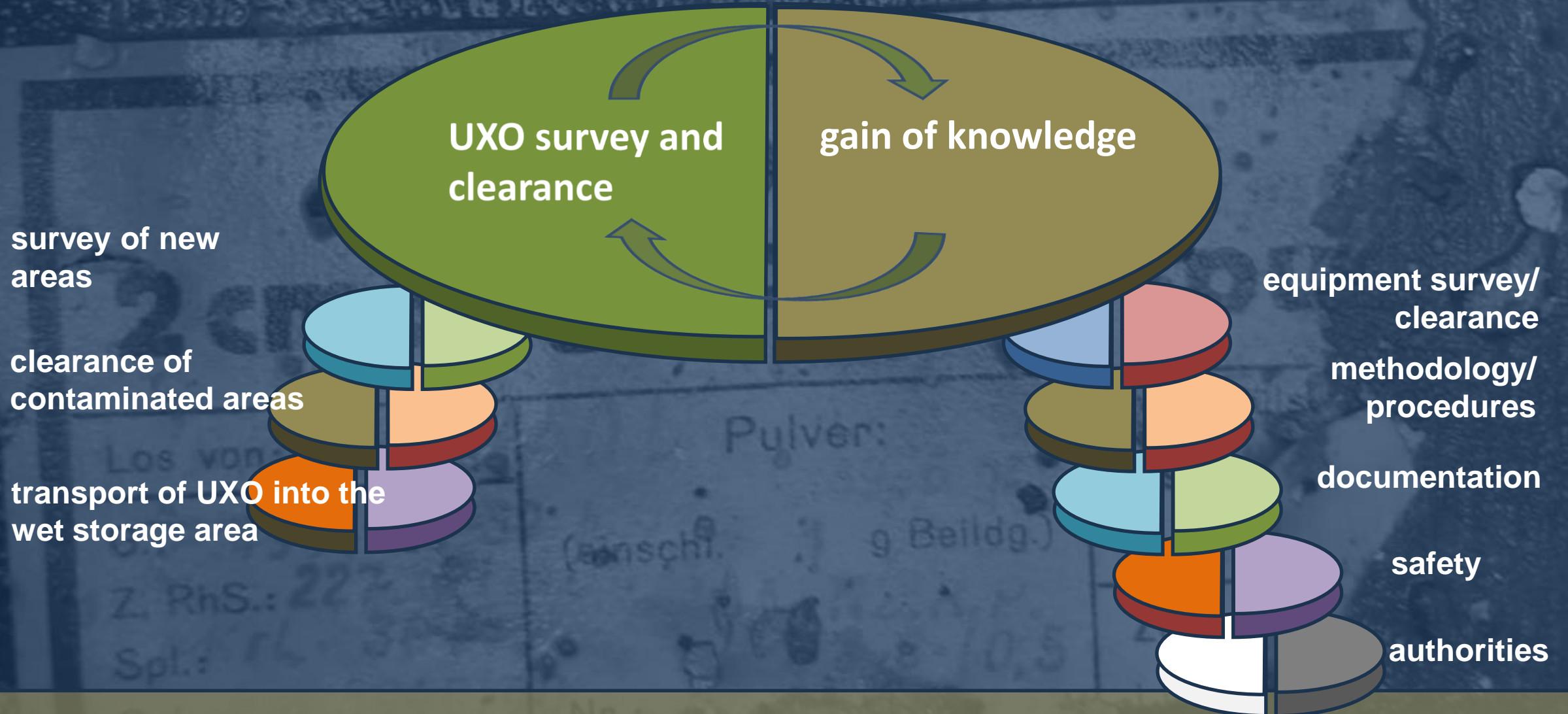
Expected amount of UXO: 1,6 mio. tons!

1.600.000 : 1682t / year  
in case every object would be a 1000lbs  
bomb

**951 years**



gains of the so called „Sofortprogramm“







# the German "Sofortprogramm" – a first step towards the clearance of dumping areas

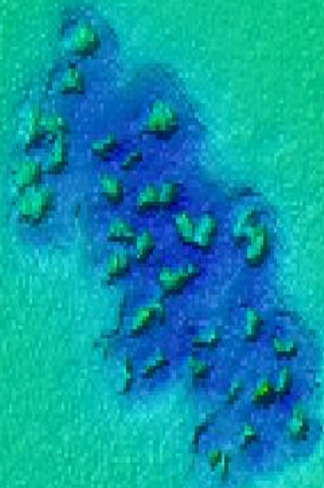
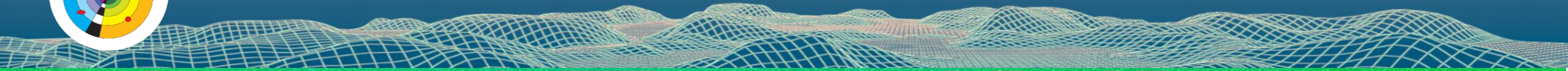






There are supposed to be about 400 of this singular dumpsites only in the  
“Lübecker Bight”



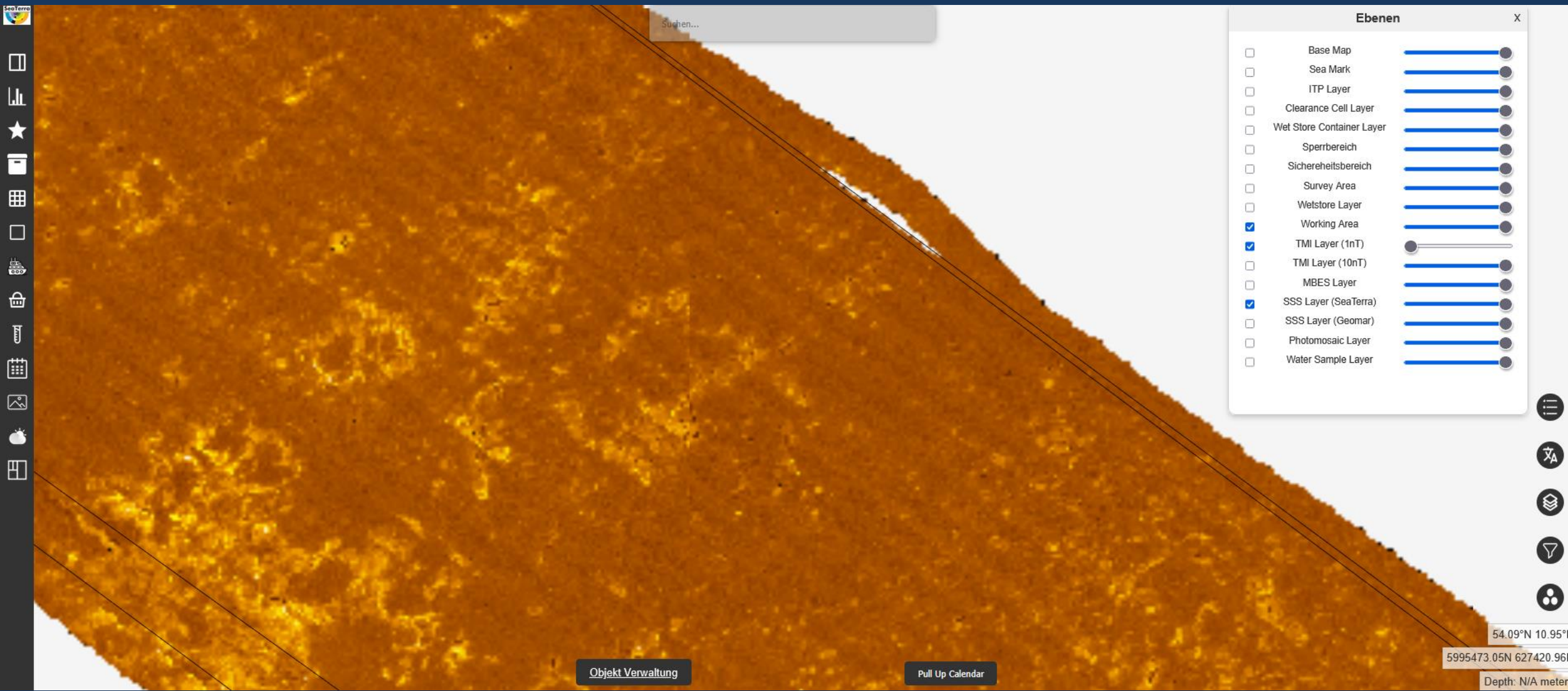


Whether these are individual spots or partial areas of large-scale dumping that are interconnected at depth, needs to be checked.





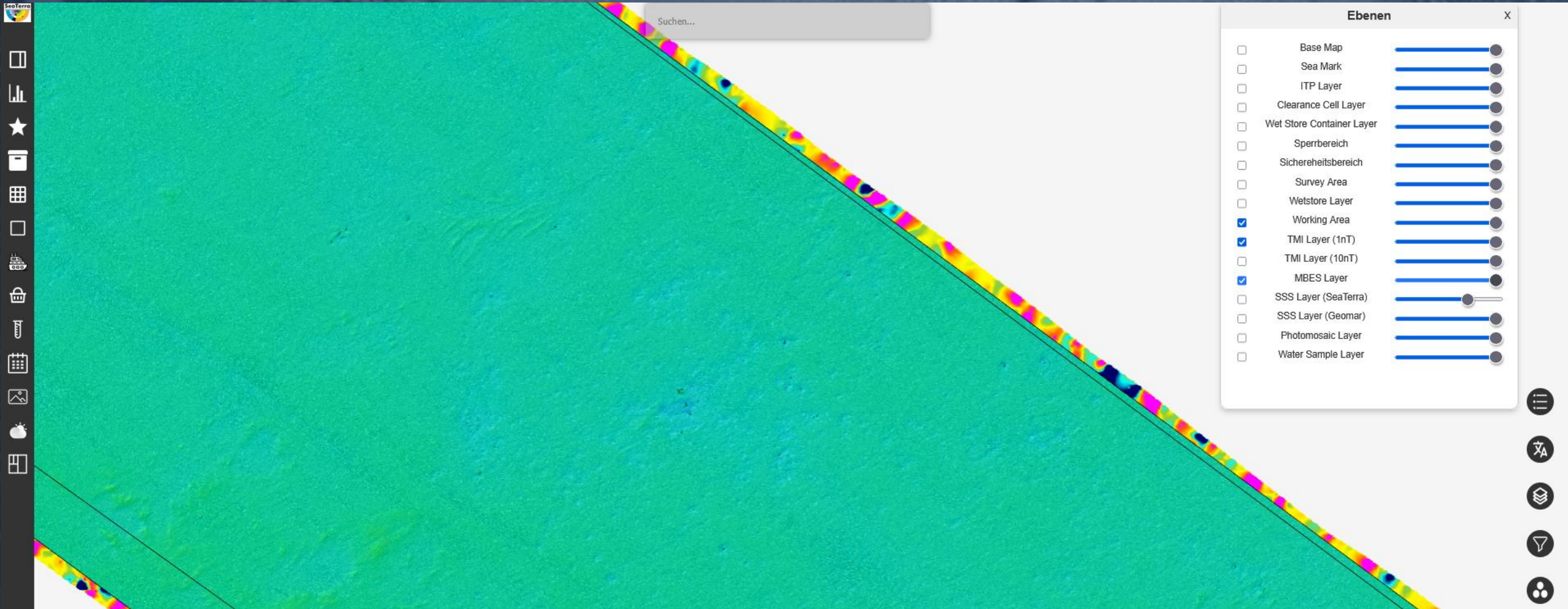
# Pelzerhaken, an unknown ammunition dump site?







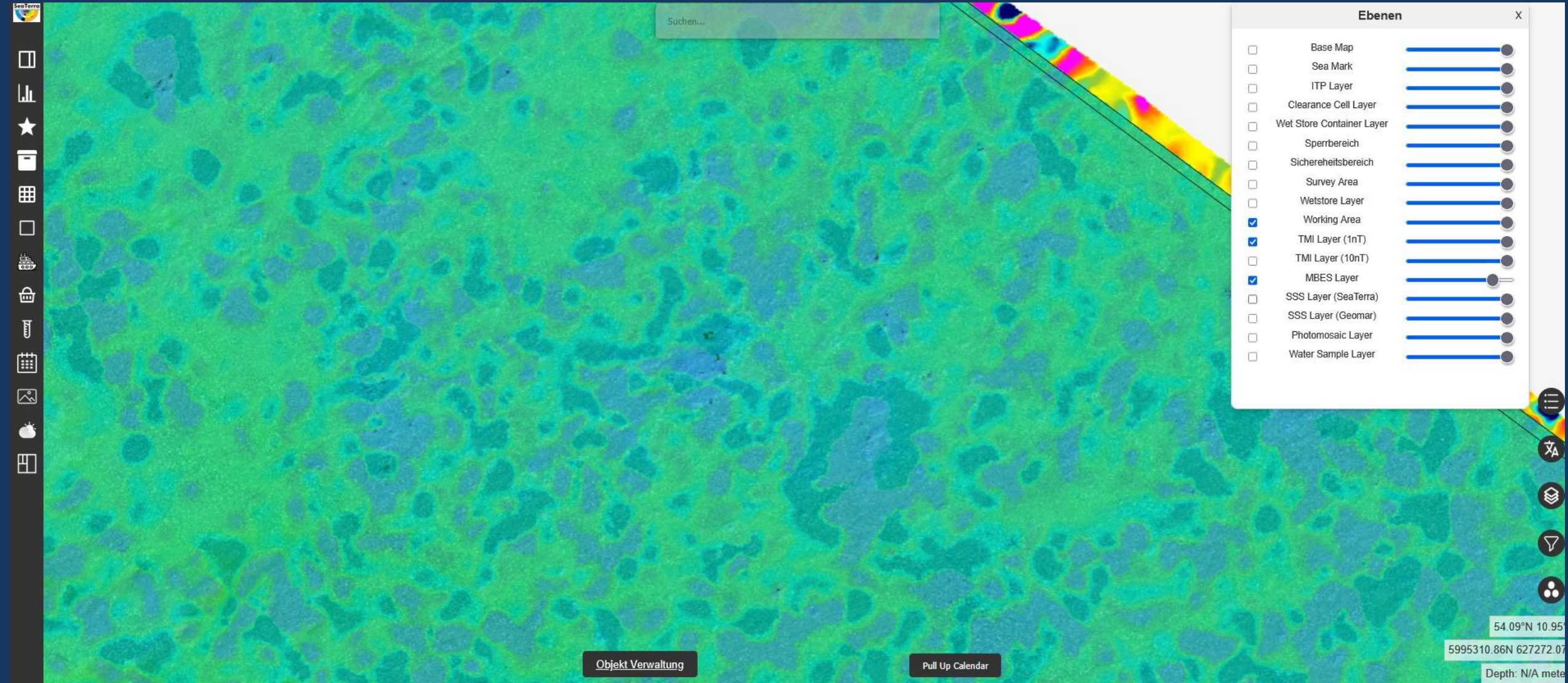
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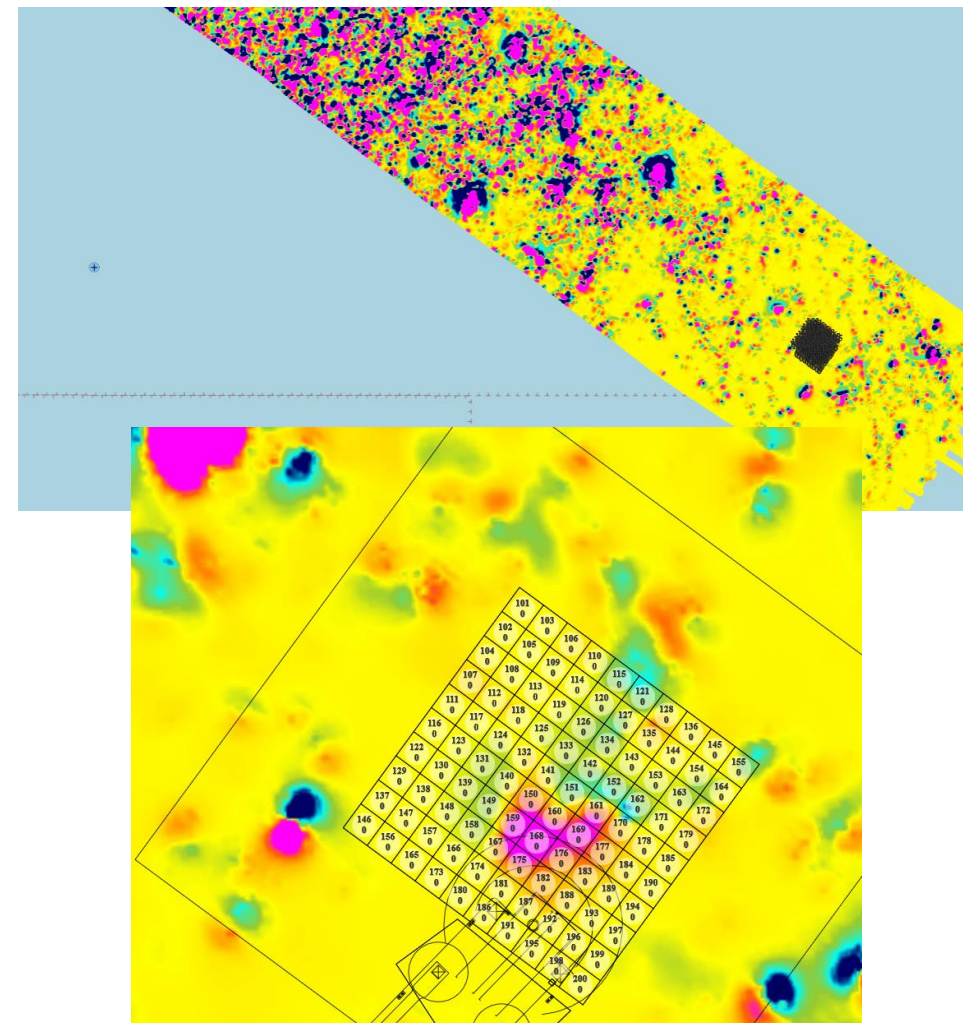
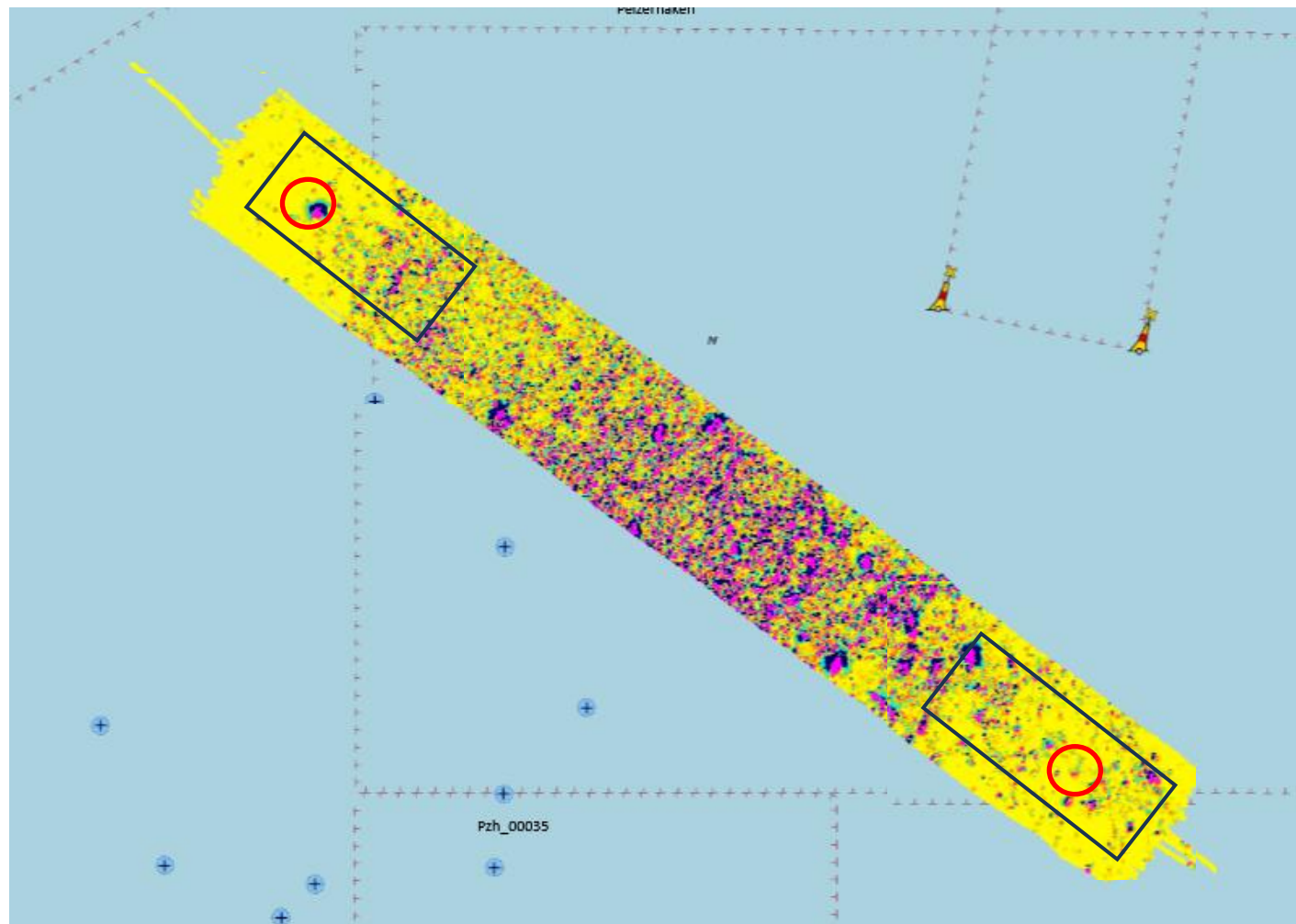
# Pelzerhaken, an unknown ammunition dump site?





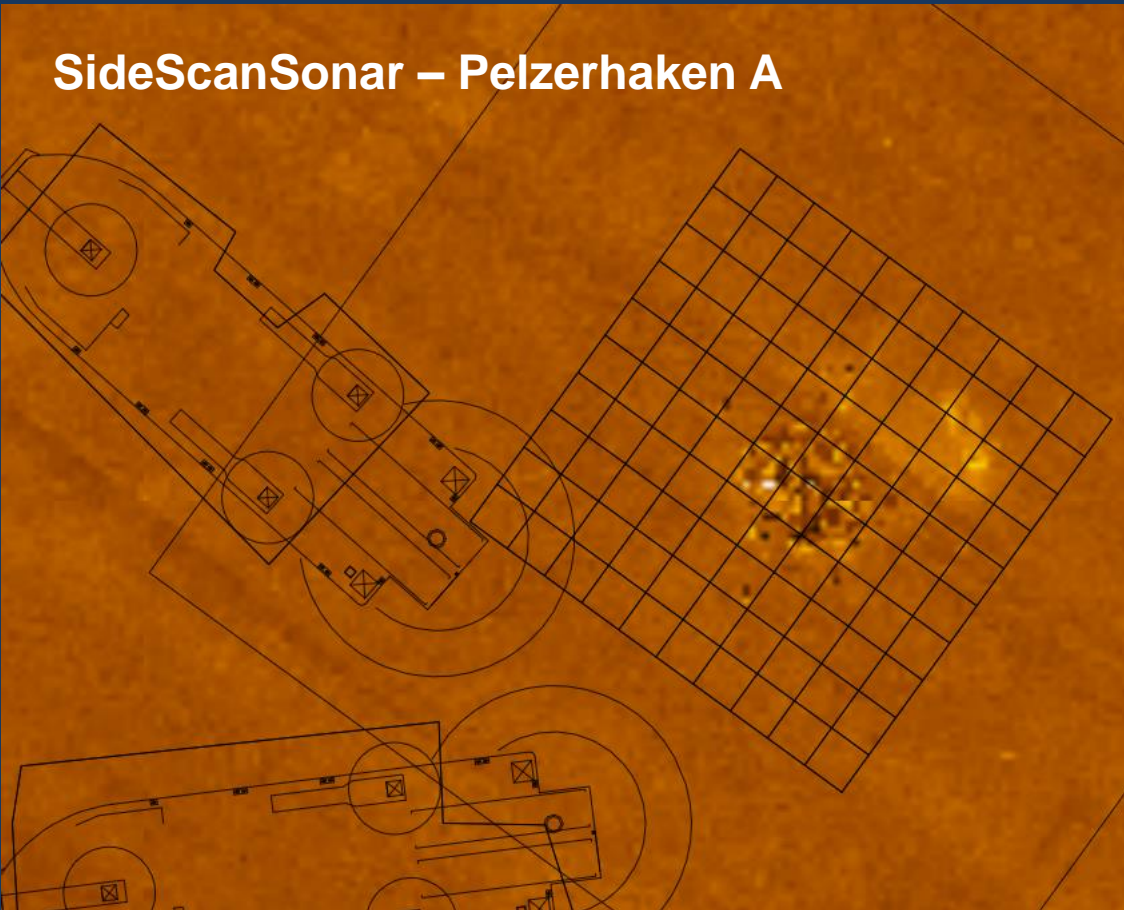


# SURVEY – magnetic– Pelzerhaken

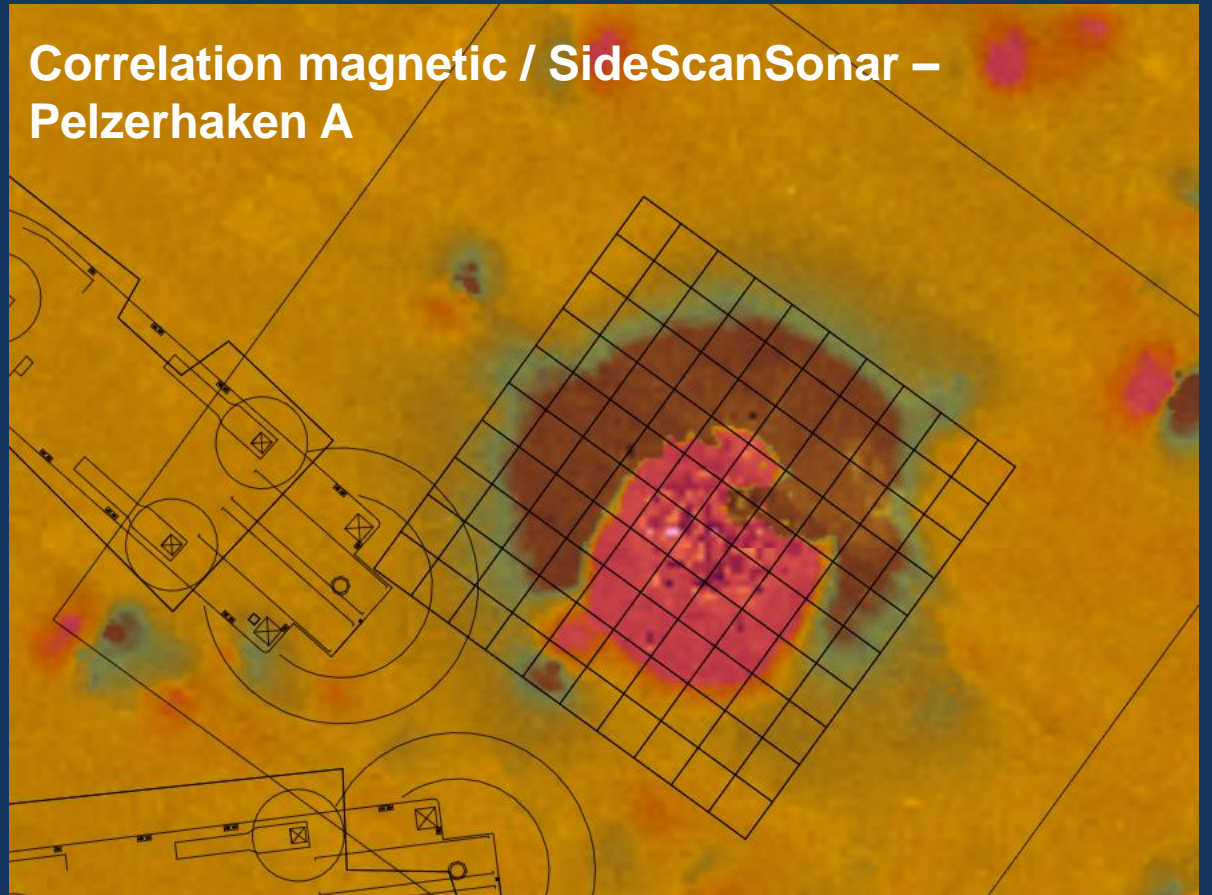




SideScanSonar – Pelzerhaken A

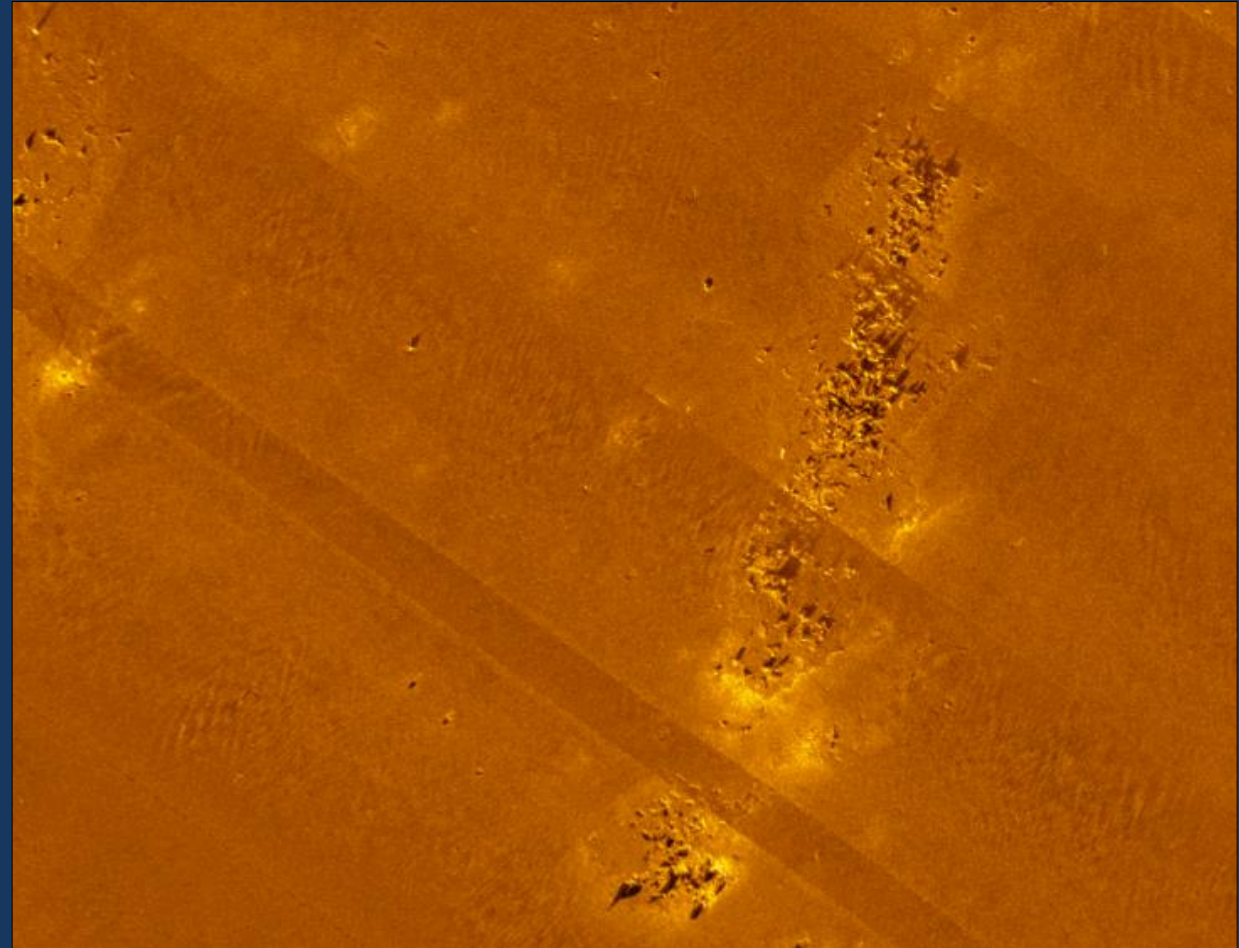
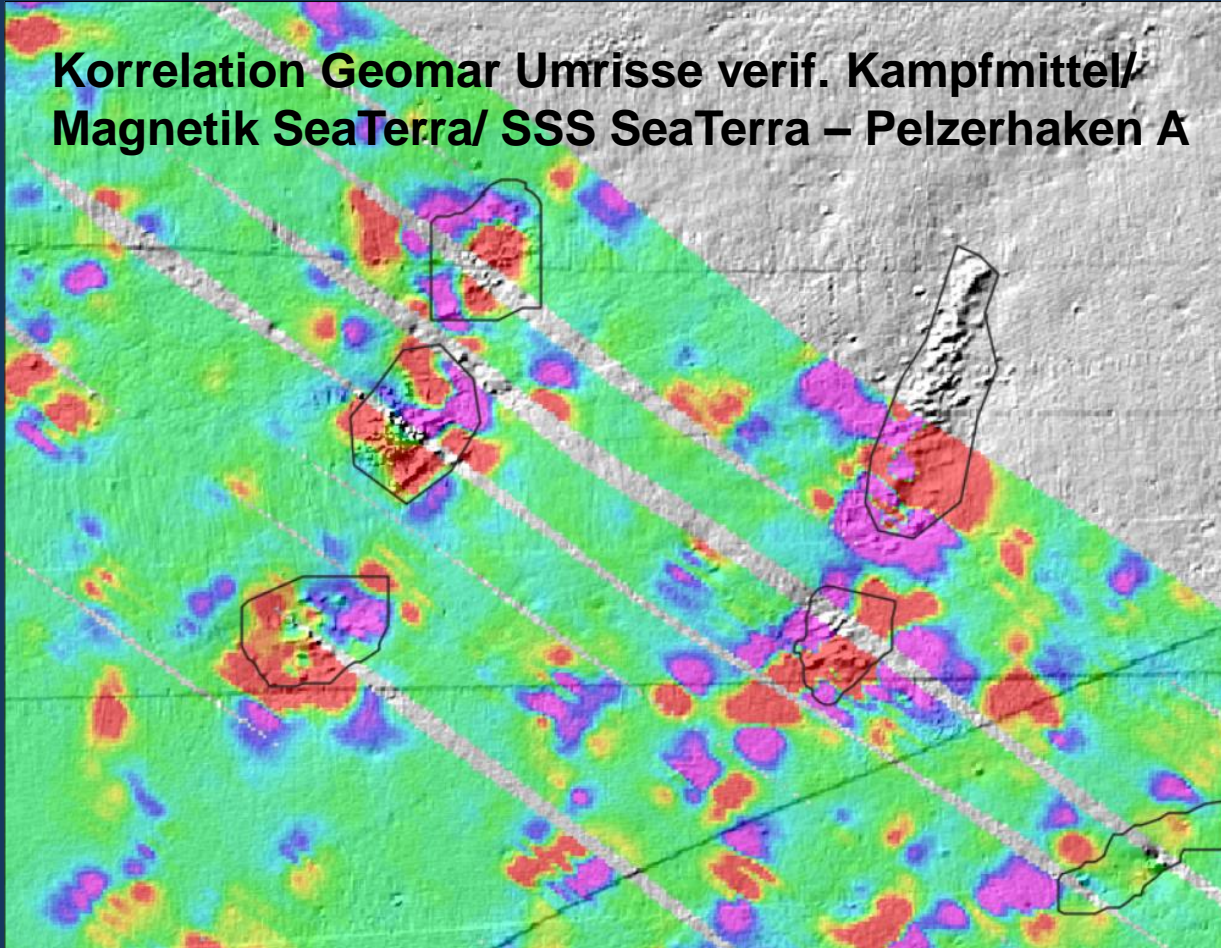


Correlation magnetic / SideScanSonar – Pelzerhaken A





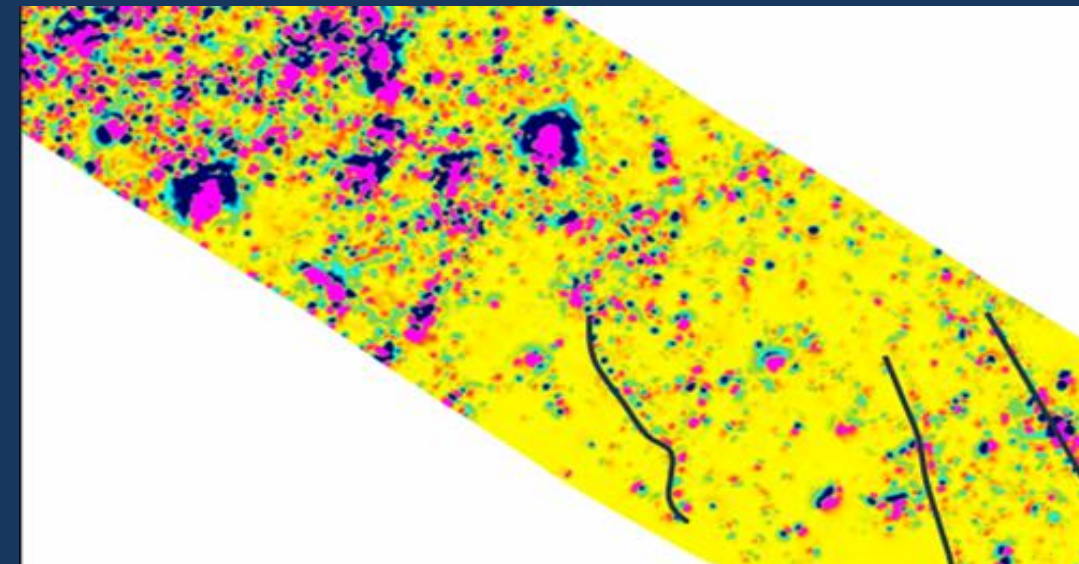
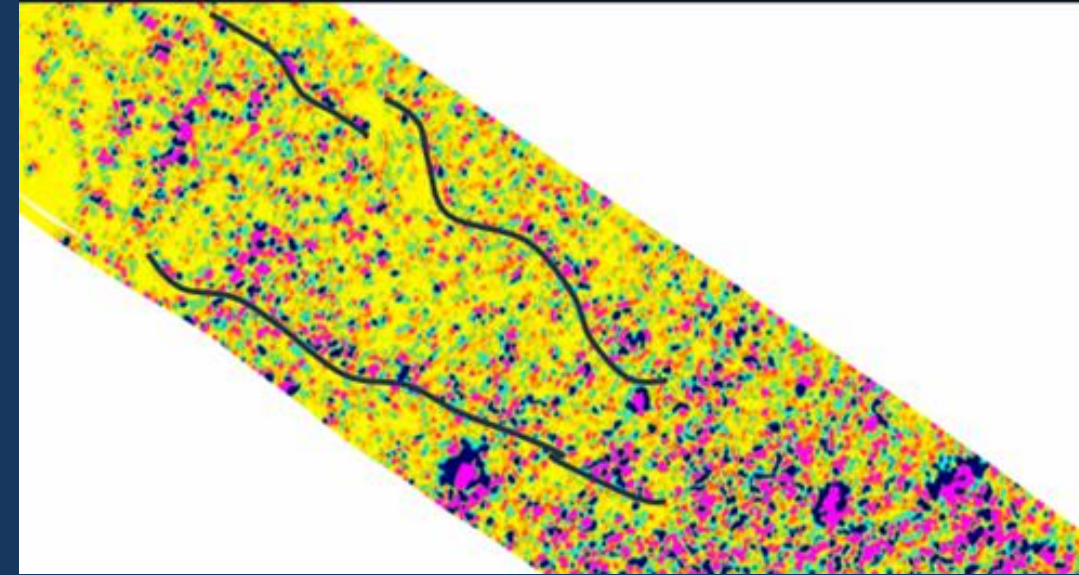
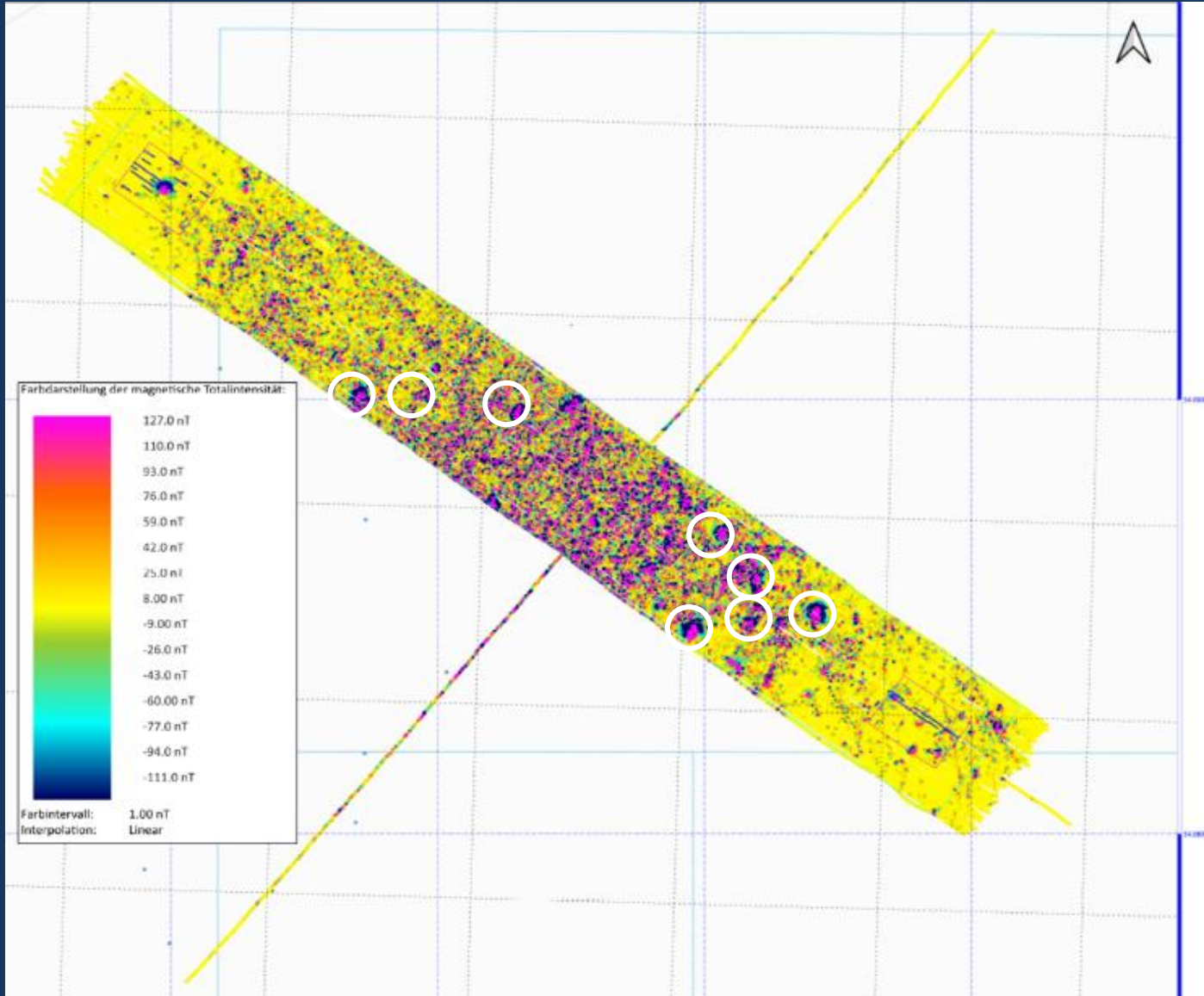
**Korrelation Geomar Umrisse verif. Kampfmittel/  
Magnetik SeaTerra/ SSS SeaTerra – Pelzerhaken A**







# Pelzerhaken \_ indications for an ammunition dump site







# Operational steps for survey and clearance at Haffkrug/ Pelzerhaken

## Phase 1

### 1. Survey

- Mobilisation of survey vessel
- SideScanSonar survey
- Multibeam survey
- Magnetic survey
- Interpretation of all data



### 2. Clearance

- Mobilisation of clearance vessel
- Remote operated "smart grabber"
- Basket Handling on the seafloor
- Loading/ lifting of the baskets
- Diving operations for identification



### 3. Handling on board

- Sorting of UXO
- Cleaning of UXO
- Packing into storage facilities

### 4. Documentation

- Foto documentation
- Identification of type/ calibre
- Status of corrosion
- Type of explosive



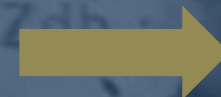
### 5. Wet- storage

- Numbering wet store container
- Transport to wet store
- Wet-storing of UXO for disposal



### 6. Reporting

- Clearance documentation
- Evaluation report
- Upscaling report



## Phase 2

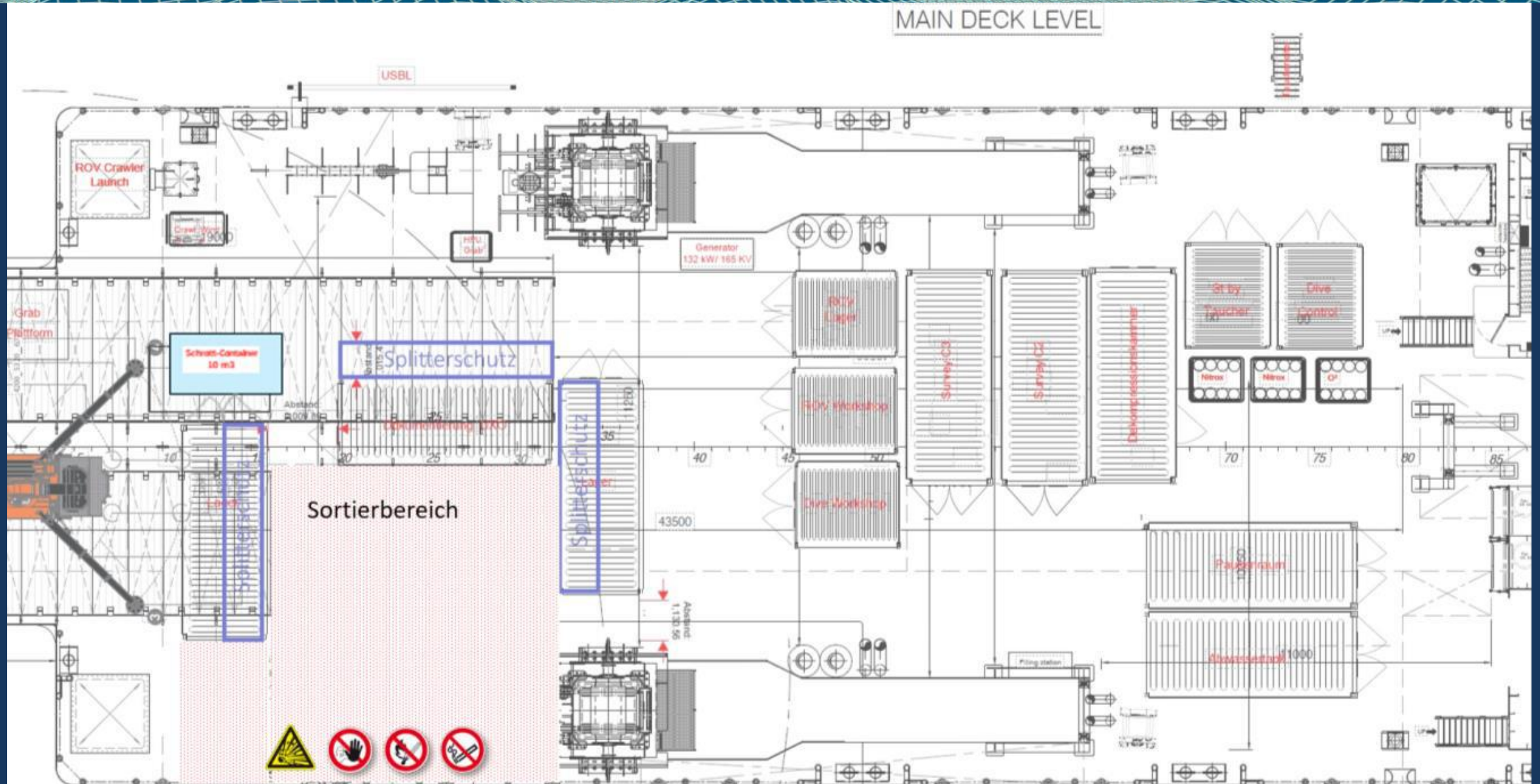




# The "Sofortprogramm" – Technical components CLEARANCE –



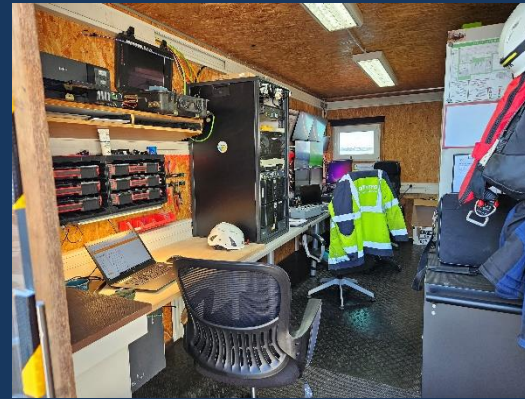








## technical components for UXO clearance







first impression by ROV

Roll: -0  
Pitch: -41  
Dpt: 17.3m

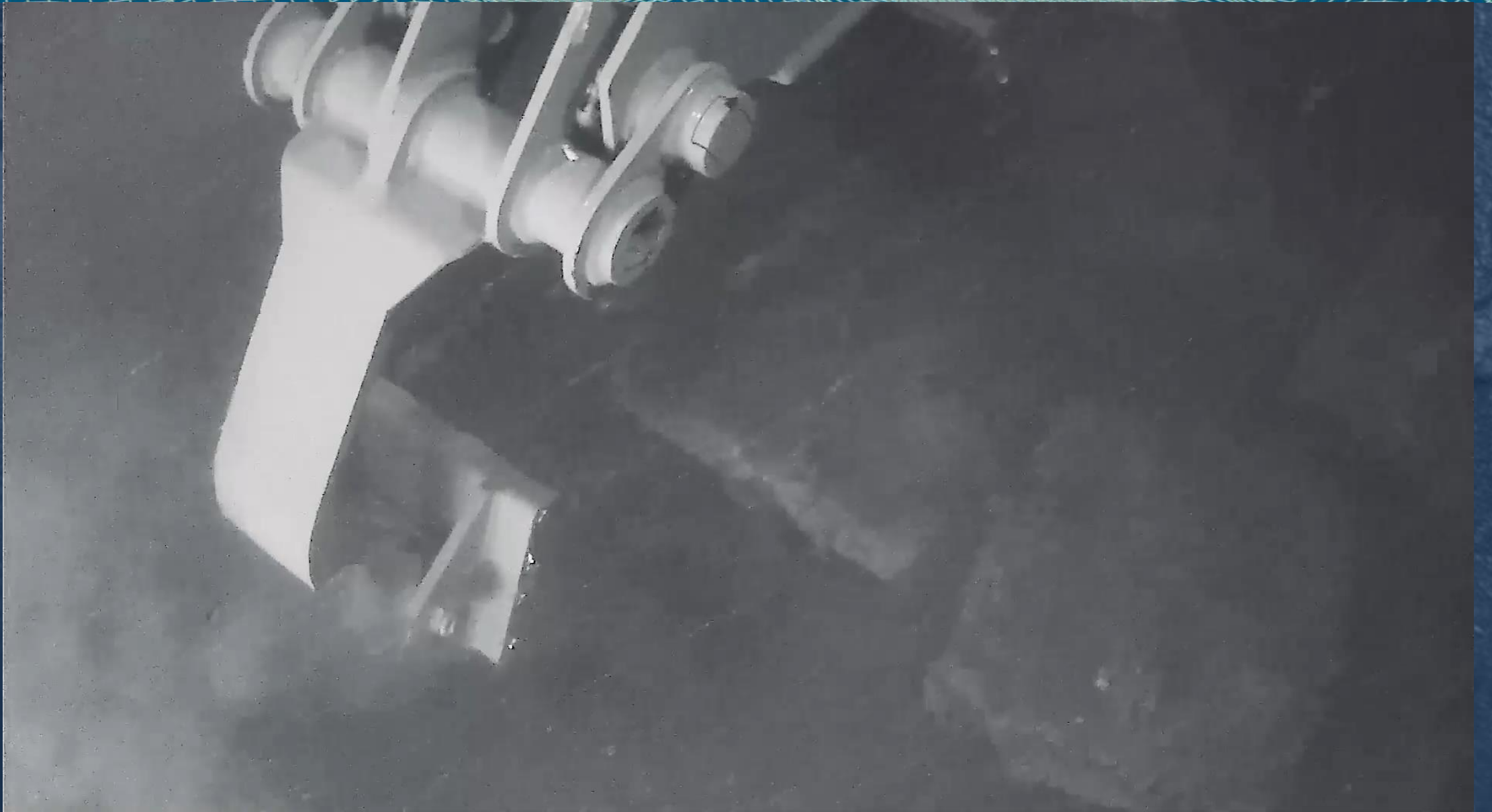
Hdn: 334  
Trn: 0

Date: 240912  
Clk: 16:24:14





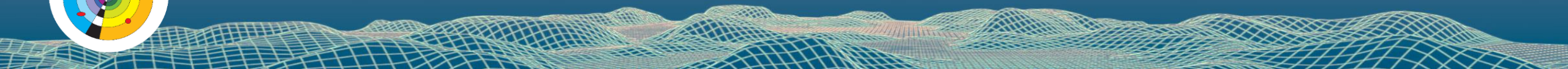
loading of the baskets by remote controlled grabber



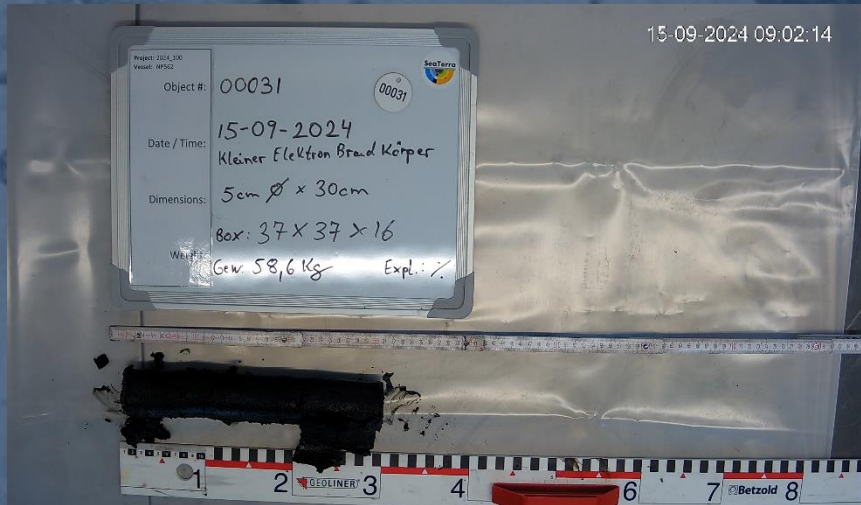
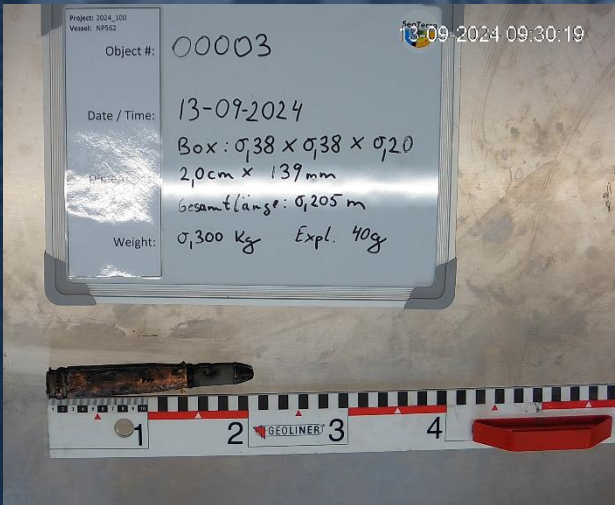




## lifting of the UXO- offshore baskets



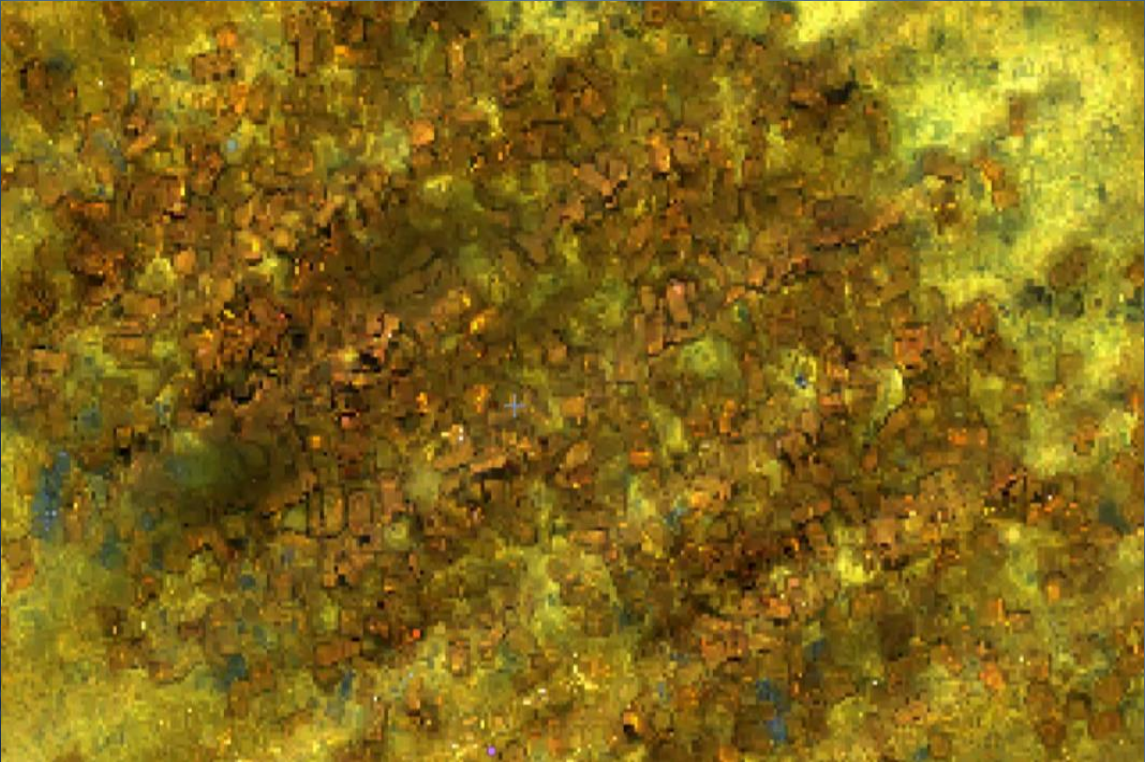








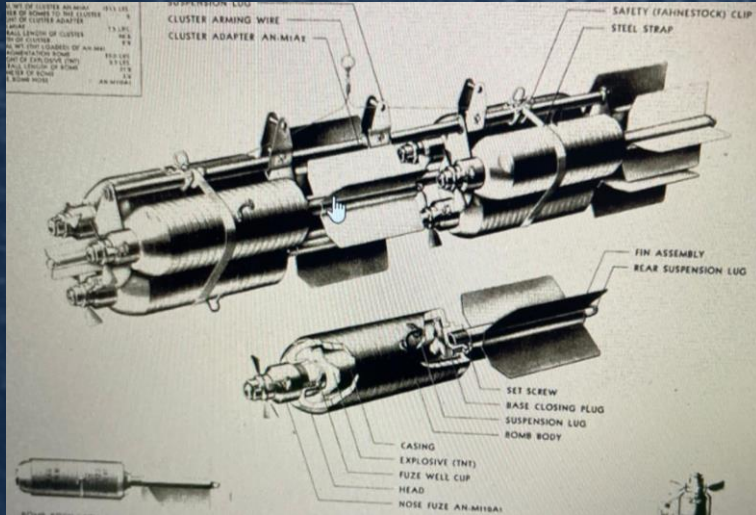






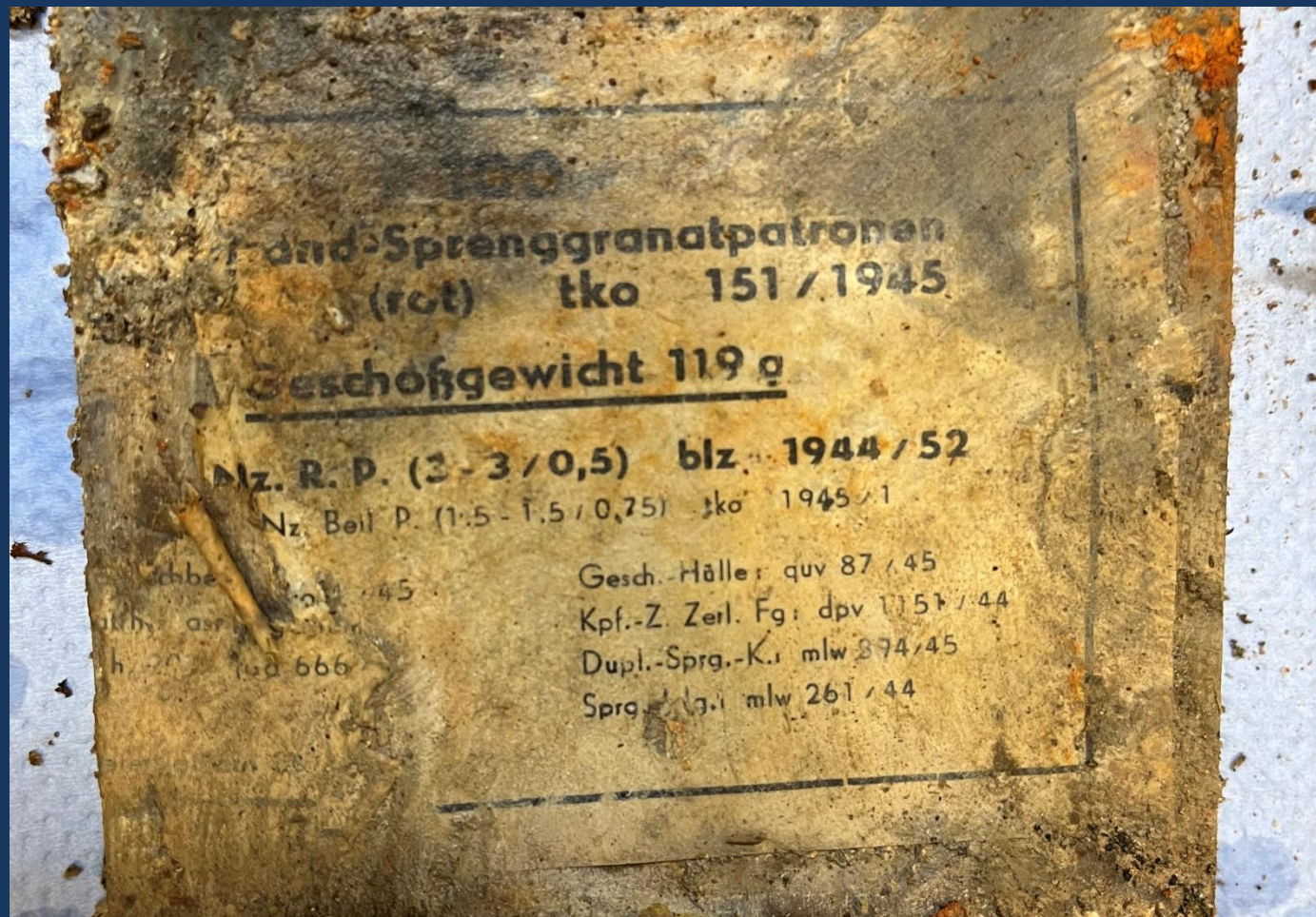


## unexpected findings – 20-pound fragmentation cluster bombs



Based on the explosive ordnance examinations and video recordings, all finds were interpreted as Allied air dropped ammunition. The objects examined are “cluster bomb drop containers No. 23 Mk I or No. 24 Mk I for 14 or 20 modified U.S. 20-pound fragmentation bombs (with parachute)”. There appear to be two detonator types 885 (for the drop container) and 873 (for the fragmentation bombs).









## packing of ammunition in storage containment







## lowering of the storage containments back to the seafloor for phase 2



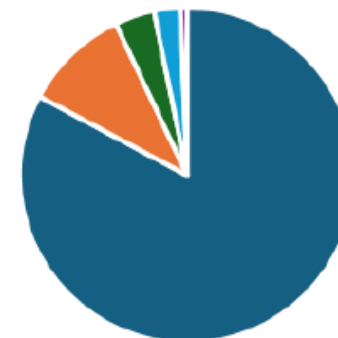




# statistics about ammunition cleared during the “Sofortprogramm”


Kampfmitteltyp	Anzahl der Funde	Prozentualer Anteil
Phosphor WP	1	0.6%
2 cm x 139 Spreng Granat Patrone	55	35.0%
2 cm x 139 Pz Spreng Granat Patrone	25	15.9%
2 cm Spreng Granat Patrone	20	12.7%
Kleiner Elektronbrand Körper	11	7.0%
2 cm x 105 Pz Spreng Granat Patrone	6	3.8%
3cm x 139 Spreng Granat Patrone	6	3.8%
Kleiner Elektronkörper für Brandmunition	5	3.2%
2 cm Minengeschoß	4	2.5%
7.92mm Geschoß	4	2.5%
2 cm Pz Spreng Granate	2	1.3%
2 cm Spreng Granate	2	1.3%
Patronen	2	1.3%
2 cm Granate Minengeschoß	1	0.6%
2 cm Minen	1	0.6%
2 cm Pz Spreng Granat Patrone	1	0.6%
2 cm Spgr. Granat. Patronen mit Papphülsen	1	0.6%
2 cm Spreng Granat Lsp	1	0.6%
2 cm Spreng Minen Geschoß	1	0.6%
2 cm x 104.9 Pz Patronen	1	0.6%
2 cm x 105 Pz Spreng Granat Patrone Leuchtspur Zerleger	1	0.6%
2 cm x 8.6 Pz Spreng Granat Patrone	1	0.6%
3cm Spreng Granate	1	0.6%
Detonatoren/ Zünder verschiedene Modelle	1	0.6%
inerte Teile / Splitter / Munitionsschrott	1	0.6%
Infanteriemunition / Munitionsteile/-schrott	1	0.6%
Munitionsschrott und inerte Teile aus dem Sortierbereich	1	0.6%
Summe	157	100.0%

Kampfmitteltyp	Anzahl der Funde	Prozentualer Anteil
Phosphor WP	1	0.6%
Rohrwaffenmunition bis D<=5 cm	130	82.8%
sonstige spreng- u. zündkräftige Kampfmittel	16	10.2%
Munitionsfunde für Hand- und Maschinenwaffen	6	3.8%
Zünder / inerte Teile / Splitter / Munitionsschrott	4	2.5%
Summe	157	100.0%

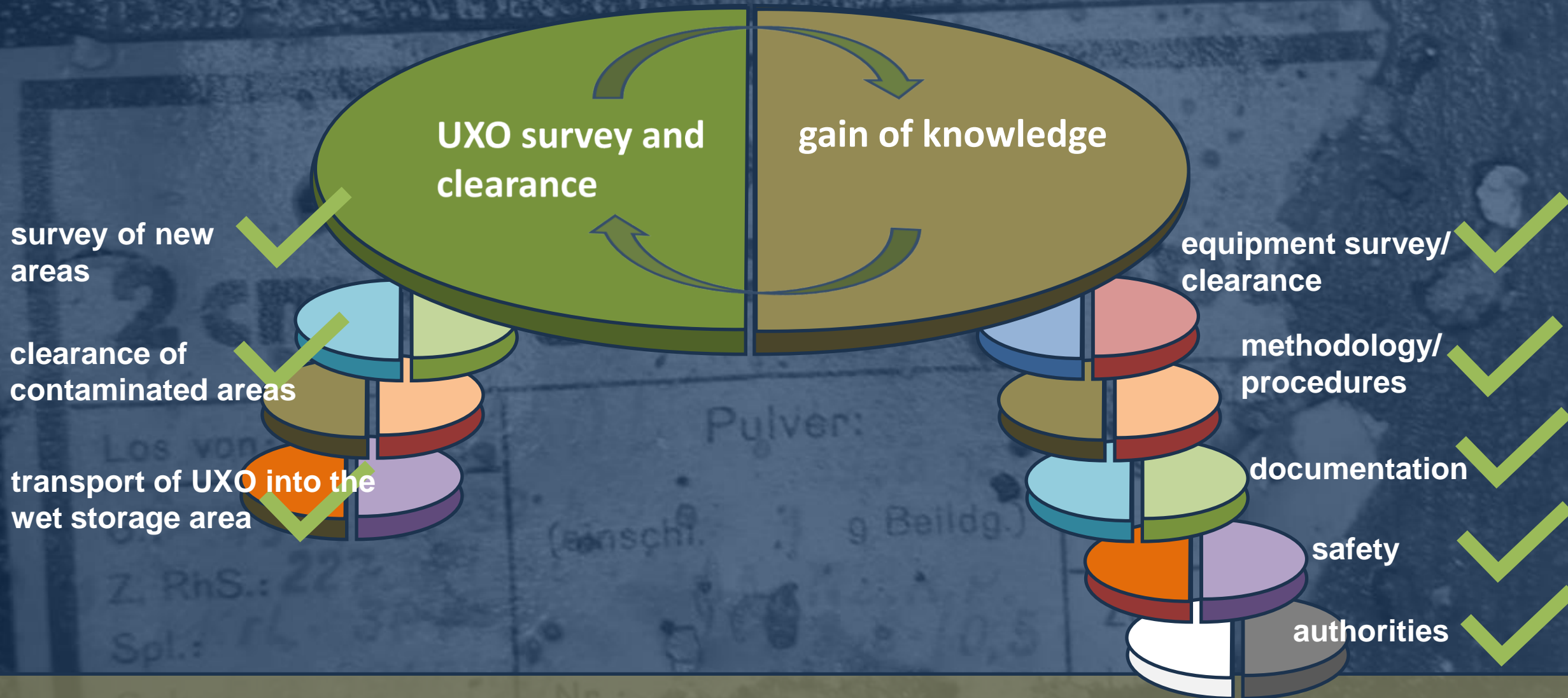


- Rohrmaschinenmunition bis D<=5 cm
- sonstige spreng- u. zündkräftige Kampfmittel
- Munitionsfunde für Hand- und Maschinenwaffen
- Zünder / inerte Teile / Splitter / Munitionsschrott
- Phosphor WP



Kampfmittelzustand (qualitative Einschätzung des verantwortlichen Truppführers)	Anzahl der Funde	Prozentualer Anteil	
„schlecht“ (z.B. Munition mit völlig freiliegenden Zündsystemen oder bei denen nicht einschätzbar war, ob das Zündsystem noch gesichert ist)	96	61.1%	
„mittel“ (vorgefundener Zustand des Zündsystems wurde zwischen „schlecht“ und „gut“ eingestuft)	32	20.4%	
„gut“ (Der Zünder / das Zündsystem und seine Sicherungselemente konnten identifiziert werden. Diese Zustandsklassifikation wurde bis hin zur leichten Korrosion des Zündsystems und seiner Sicherungselemente verwendet.)	29	18.5%	
Summe	157	100.0%	









**Thanks for your passion!**

**Dieter Guldin**  
SeaTerra GmbH

**Geophysik & Kampfmittel Dienstleistungen GmbH**  
An der Trift 21  
16348 Wandlitz - Germany  
Tel.: +49 (0)33397 297 27  
Fax: +49 (0)33397 297 29  
[www.seaterra.de](http://www.seaterra.de)