



ADEDE
SEARCH & RECOVERY

PRESENTATION HYDRO '17 – 15/11/2017

CHALLENGES IN UXO-DETECTION: COMBINING DIFFERENT GEOPHYSICAL TECHNIQUES WITHIN UXO INVESTIGATION & CLEARANCE

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ABOUT US: GENERAL

ADEDE was founded in 2000 by Bart Van der Speeten en Jean-Paul Peisker, primarily as a UXO services company. During ADEDE's early years the former WWI battlefields in Belgium were declared National Heritage which resulted in the addition of battlefield archaeology to our portfolio of professional capabilities. Simultaneously maritime archaeology was added to our offshore services to deal with the archaeology of UXO infested offshore development sites.

Adede continuously invests in means and methods that enables it to perform the work more effectively and efficiently, resulting in a leader position when it comes to technical knowledge and equipment. We have a team of 50 highly qualified geologists, geophysicists, archaeologists, UXO experts, UXO divers and maritime archaeologists. We have our own survey vessel, a fleet of support vehicles and various geophysical equipment for both on land and in water.

ADEDE feels that a scientific approach is the best way to stay on top of technological and methodological developments in our aim to be a flexible and cost-effective partner for challenging UXO- and archaeological issues worldwide.

ABOUT US: FACTS & FIGURES

- EST. 2000
- HEADQUARTERS: GHENT, BELGIUM
- AFFILIATED BRANCHES: UK, NL, GE, NO
- +50 EMPLOYEES
- EU EXCERT MEMBER
- ADC MEMBER
- UNOPS
- CERTIFICATES & LICENSES:
 - ISO9001 2014-2017
 - WSCS-OCE 2012.1 2015-2018
 - OHSAS 18001. 2014-2017
 - §7 & §20 GERMAN WEAPONS & MUNITIONS LAW
 - UK LICENCE





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(MARINE) DETECTION PROCES UXO

- PRELIMINARY INVESTIGATION
- PREPERATION OF WORK
- DETECTION
- LOCALISATION
- EXCAVATION
- IDENTIFICATION
- TEMPORAY STORAGE FOR SAFE-KEEPING
- TRANSFER TO EOD-EXPERT
- FEED BACK (PVO)



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PRELIMINARY INVESTIGATION & PREPARATION

OBJECT CHARACTERISATION

- 🏴‍☠️ HISTORICAL RESEARCH
- 🏴‍☠️ TYPE, SIZE, MASS AND COMPOSITION OF EXPECTED OBJECTS
- 🏴‍☠️ CONTRAST WITH ENVIRONMENT: TYPE OF SEDIMENT, BACKGROUND NOISE
- 🏴‍☠️ BURIAL DEPTH

PREPARATION OF WORK

- 🏴‍☠️ PROJECT PLAN
- 🏴‍☠️ MARITIME ARCHAEOLOGY



DETECTION



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= TO DETERMINE THE PRESENCE OF (POSSIBLE) UXO BY PERFORMING MEASUREMENTS, BY MEANS OF DETECTION EQUIPMENT, AND THE SUBSEQUENT INTERPRETATION OF THE RESULTS

DETECTION. DETECTION TECHNIQUES.

- MAGNETOMETRY (PASSIVE / (NON-)REALTIME)
- ELECTROMAGNETOMETRY (ACTIVE)
- ELECTRICAL RESISTIVITY
- SONAR
 - SIDE SCAN SONAR
 - MULTIBEAM ECHOSOUNDER
 - SUBBOTTOM PROFILING
- AUTONOMOUS UNDERWATER VEHICLES
- SUPPORTING TECHNIQUES: POSITIONING BY GNSS / USBL / MRU, SOUND VELOCITY PROFILING...



DETECTION TECHNIQUES. MAGNETOMETRY.

🔦 PRINCIPLE:

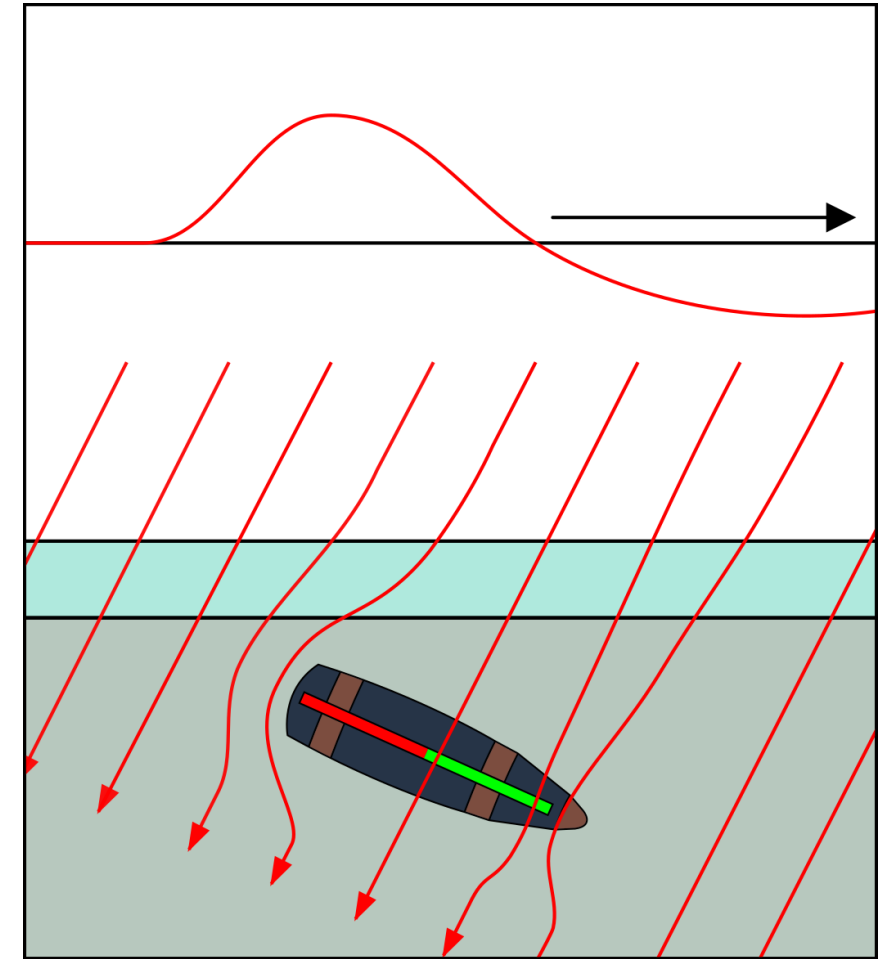
DISTURBANCE OF EARTH MAGNETIC FIELD

🔦 DETECTS:

FERROUS METALS

🔦 LIMITATIONS:

SATURATION OF SIGNAL DUE TO THE PRESENCE OF FERROUS METALS (NATURAL OR ANTROPOGENIC) IN THE AREA



Source: Vallon



MAGNETOMETRY – G882 TOTAL FIELD MAGNETOMETER



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MAGNETOMETRY – SCANFISH



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MAGNETOMETRY – GRADIOMETRY - SCANFISH



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MAGNETOMETRY – GRADIOMETRY - SCANFISH



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DETECTION TECHNIQUES. ELECTROMAGNETOMETRY.

🔦 PRINCIPLE:

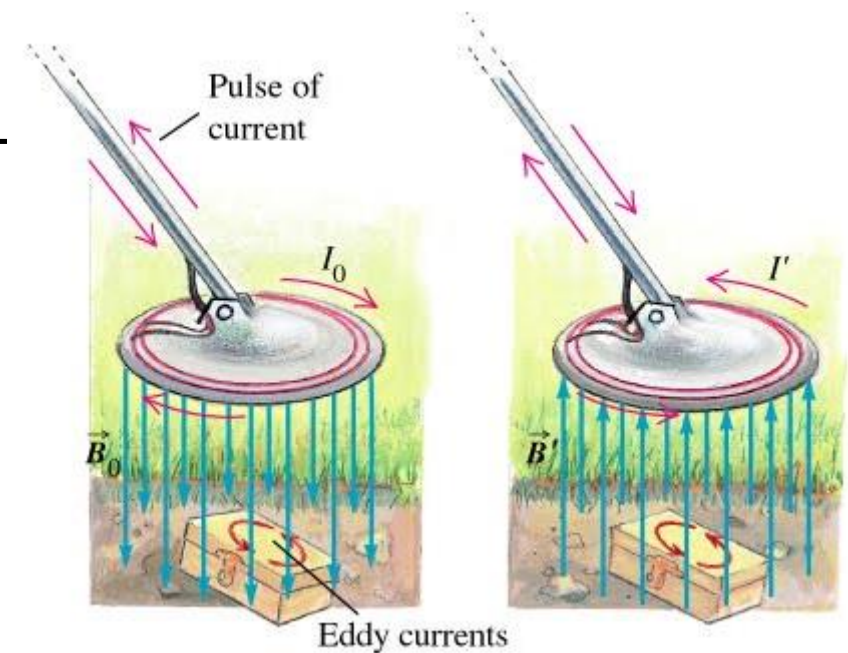
ELECTRICAL PULSE INDUCES RECORDABLE MAGNETIC FIELD

🔦 DETECTS:

ALL METALS

🔦 LIMITATIONS:

LIMITED PENETRATION DEPTH OF SIGNAL



Source: Addison Wesley Longman



ELECTROMAGNETOMETRY



DETECTION TECHNIQUES. ELECTRICAL RESISTIVITY.

🐟 PRINCIPLE:

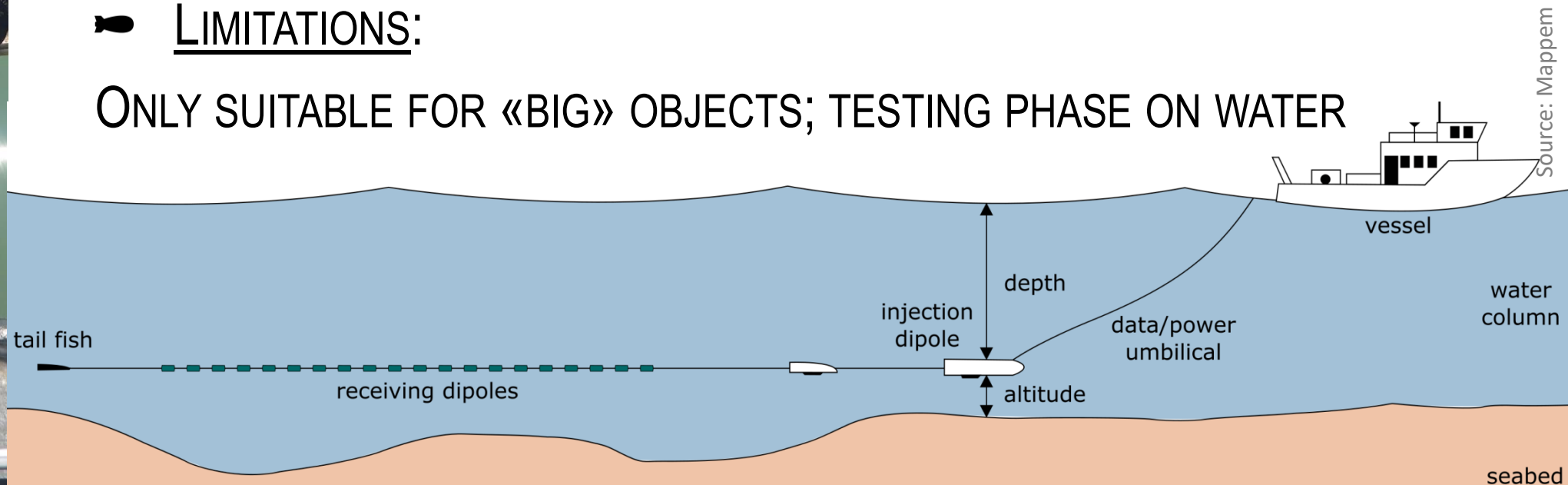
TRANSMISSION OF ELECTRICAL PULSES THROUGH AN INJECTION DIPOLE WHICH ARE THEN MEASURED BY RECEIVING DIPOLES

🐟 DETECTS:

RELATIVE ELECTRICAL RESISTANCE OF AN OBJECT

🐟 LIMITATIONS:

ONLY SUITABLE FOR «BIG» OBJECTS; TESTING PHASE ON WATER



ELECTRICAL RESISTIVITY



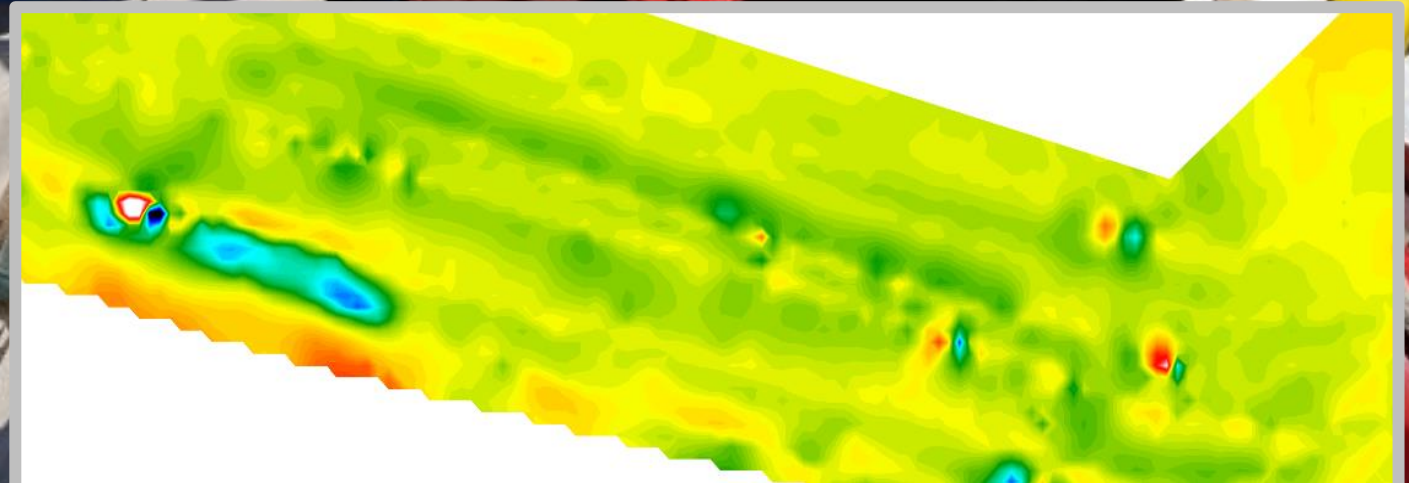
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ELECTRICAL RESISTIVITY



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Source: Mappem

🐟 PRINCIPLE:

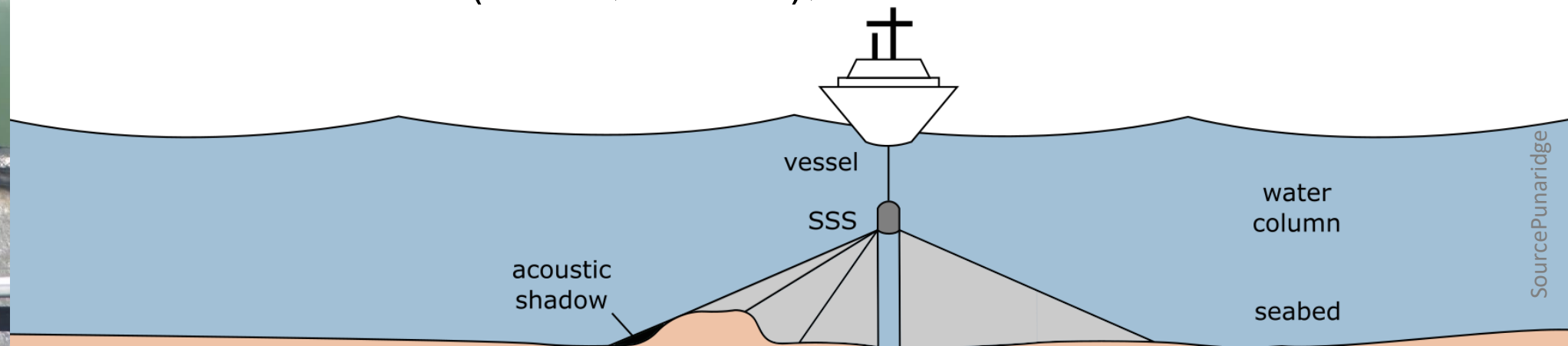
PENETRATION / ABSORPTION / REFLECTION OF SOUND WAVES

🐟 DETECTS:

OBJECTS ON OR JUST BELOW WATER BOTTOM

🐟 LIMITATIONS:

DETECTION OF NATURAL OBJECTS WITH SIMILAR CHARACTERISTICS (BLOCS, STONES), ONLY ON WATER



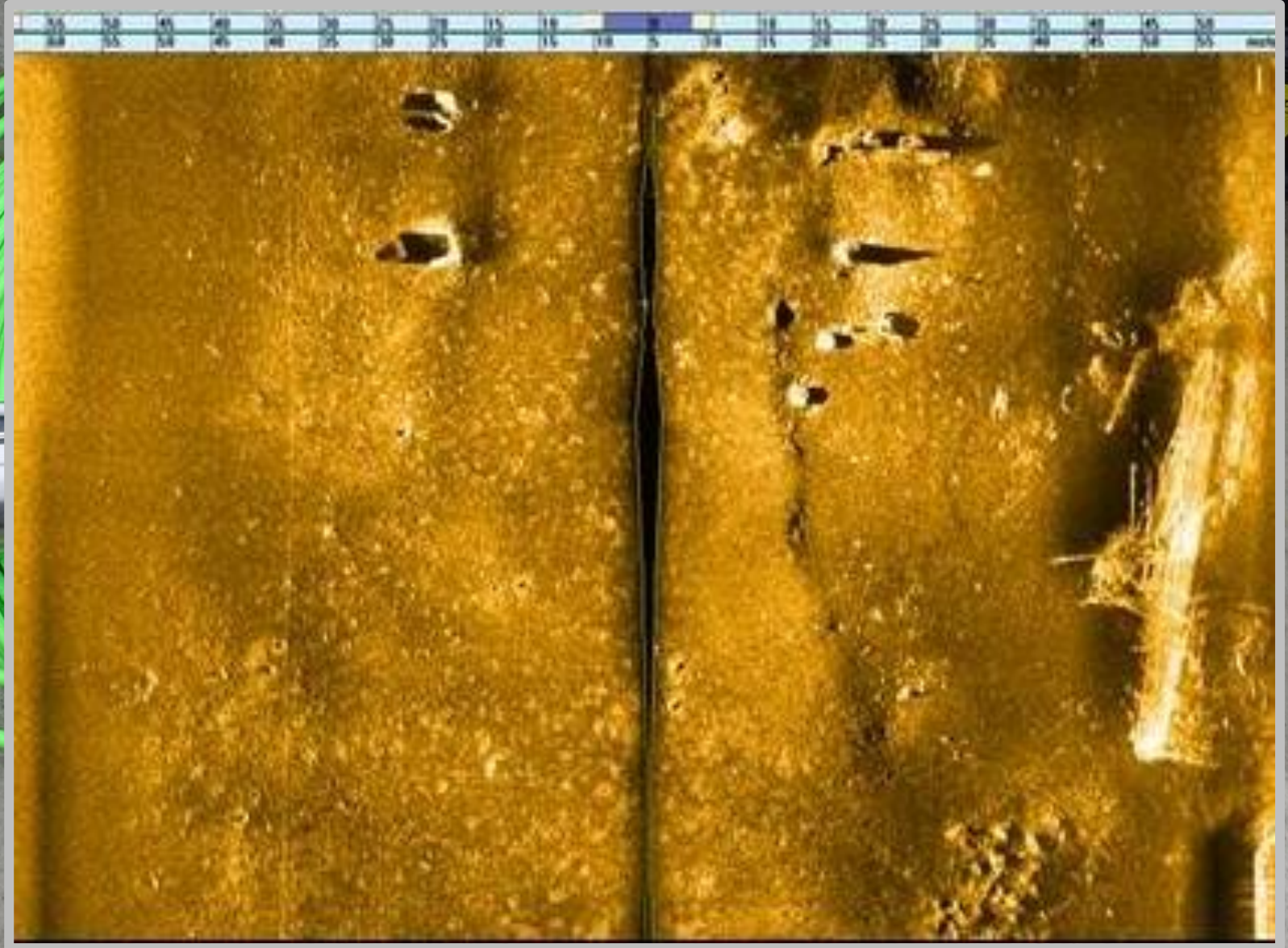
SONAR – SIDE SCAN



SONAR – SIDE SCAN



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SONAR – SUBBOTTOM PROFILER



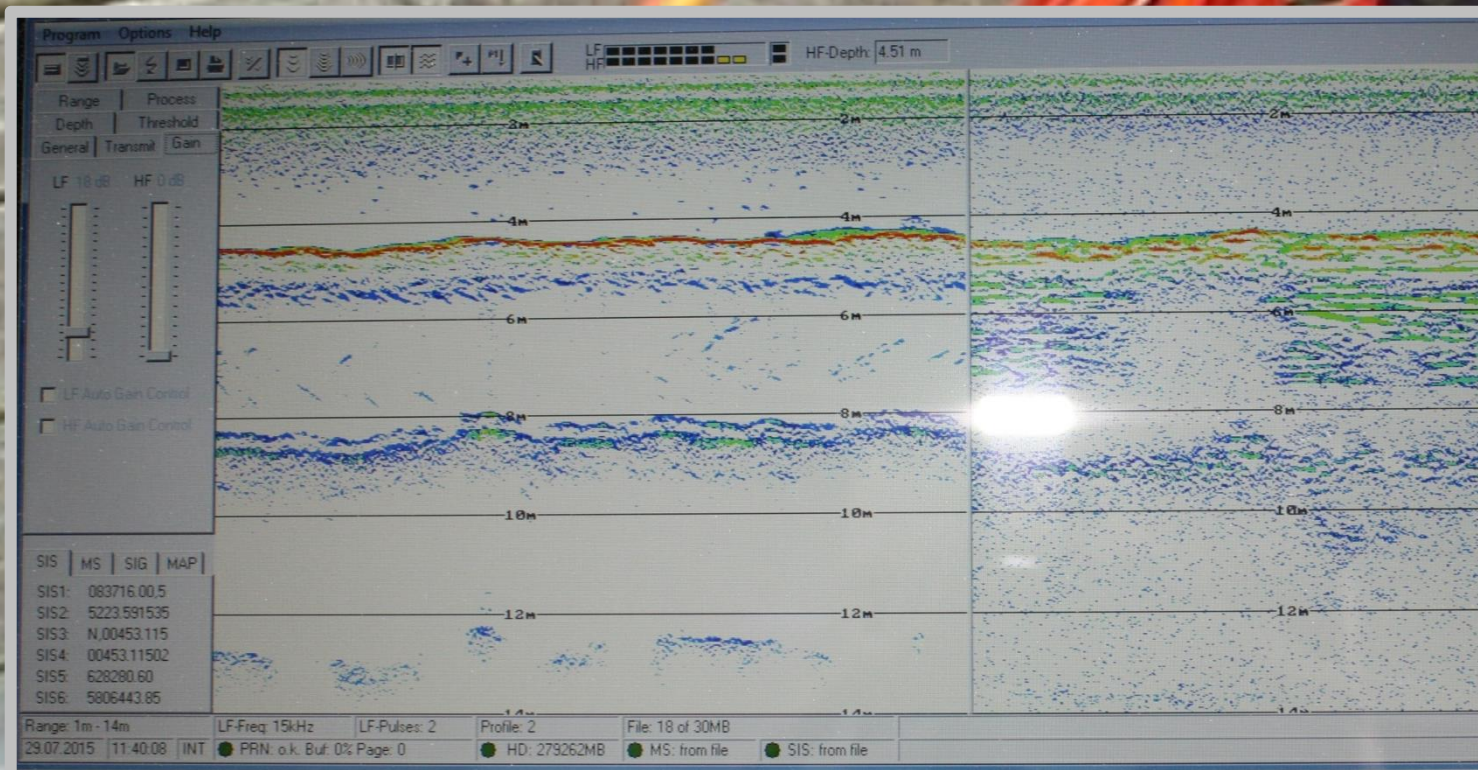
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SONAR – SUBBOTTOM PROFILER



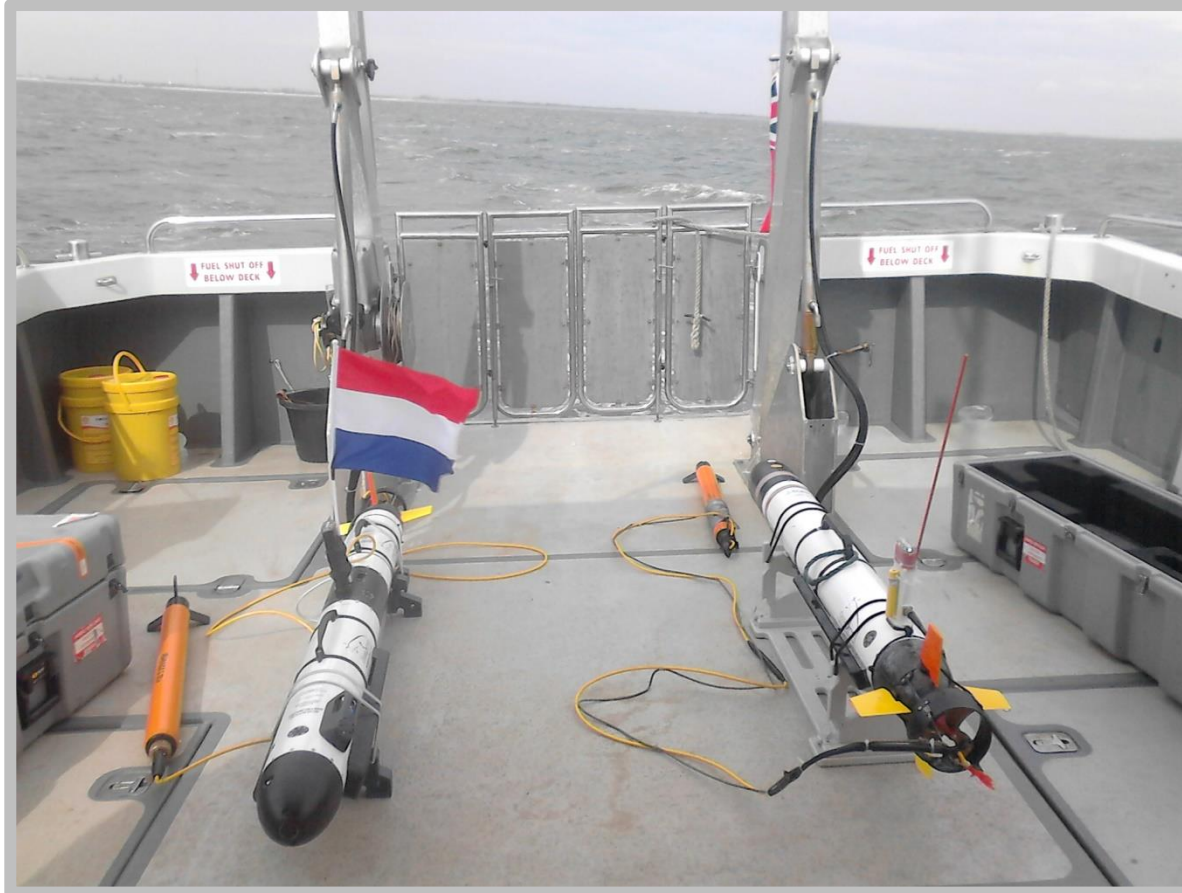
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SONAR – MULTIBEAM ECHOSOUNDER



DETECTION TECHNIQUES. AUTONOMOUS UNDERWATER VEHICLES.



DETECTION TECHNIQUES. SUPPORTIVE TECHNIQUES.

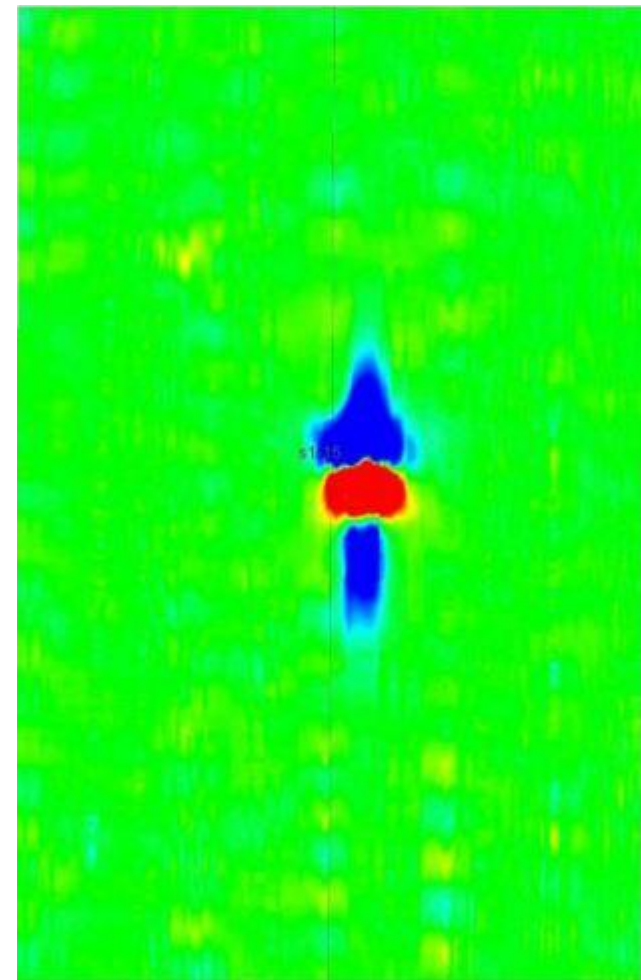
- POSITIONING BY MEANS OF:
 - GNSS RECEIVERS
 - USBL
 - MRU
 - SOUND VELOCITY PROFILING
 - ...



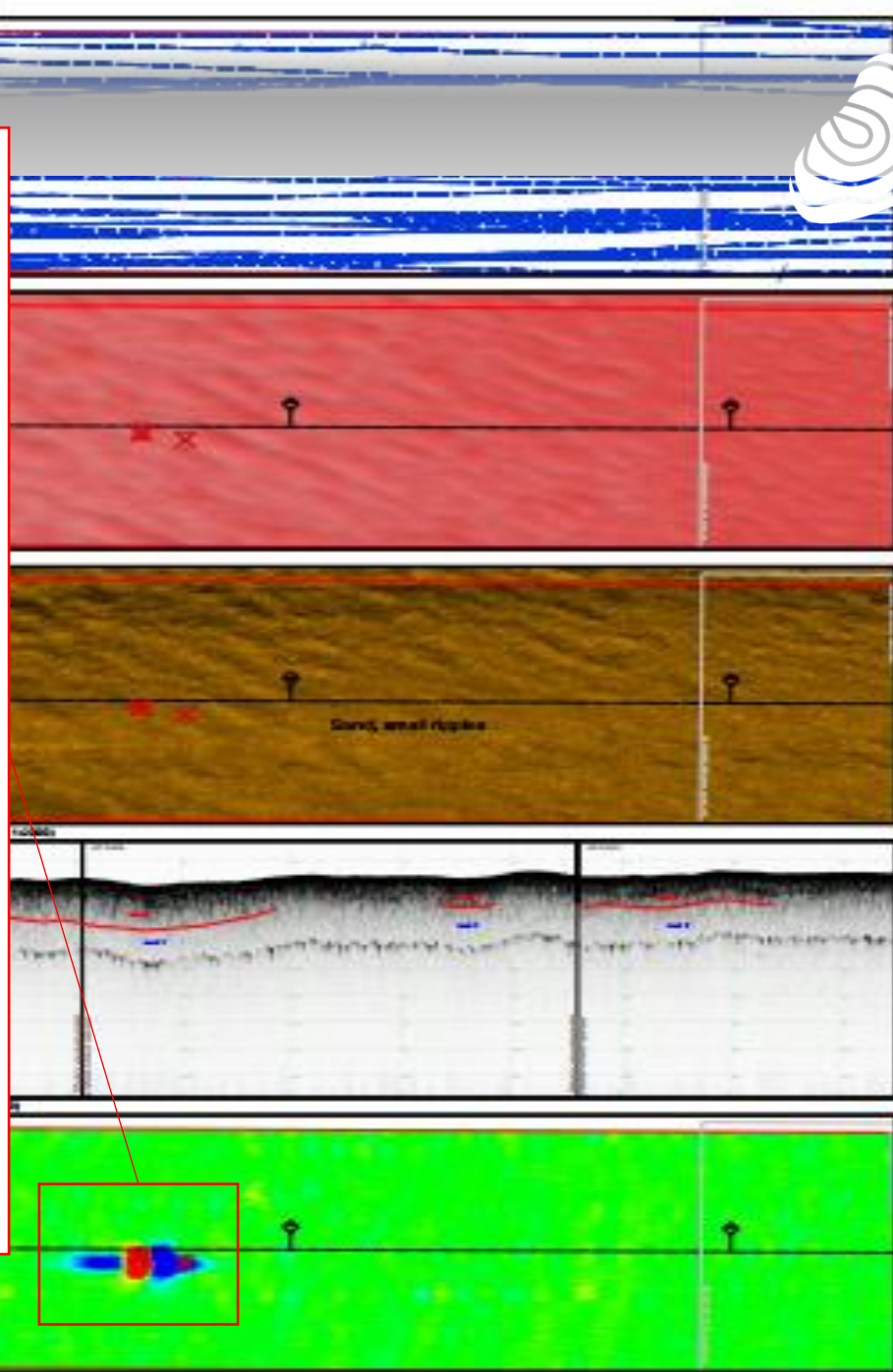
PROCESSING: EXAMPLE 1



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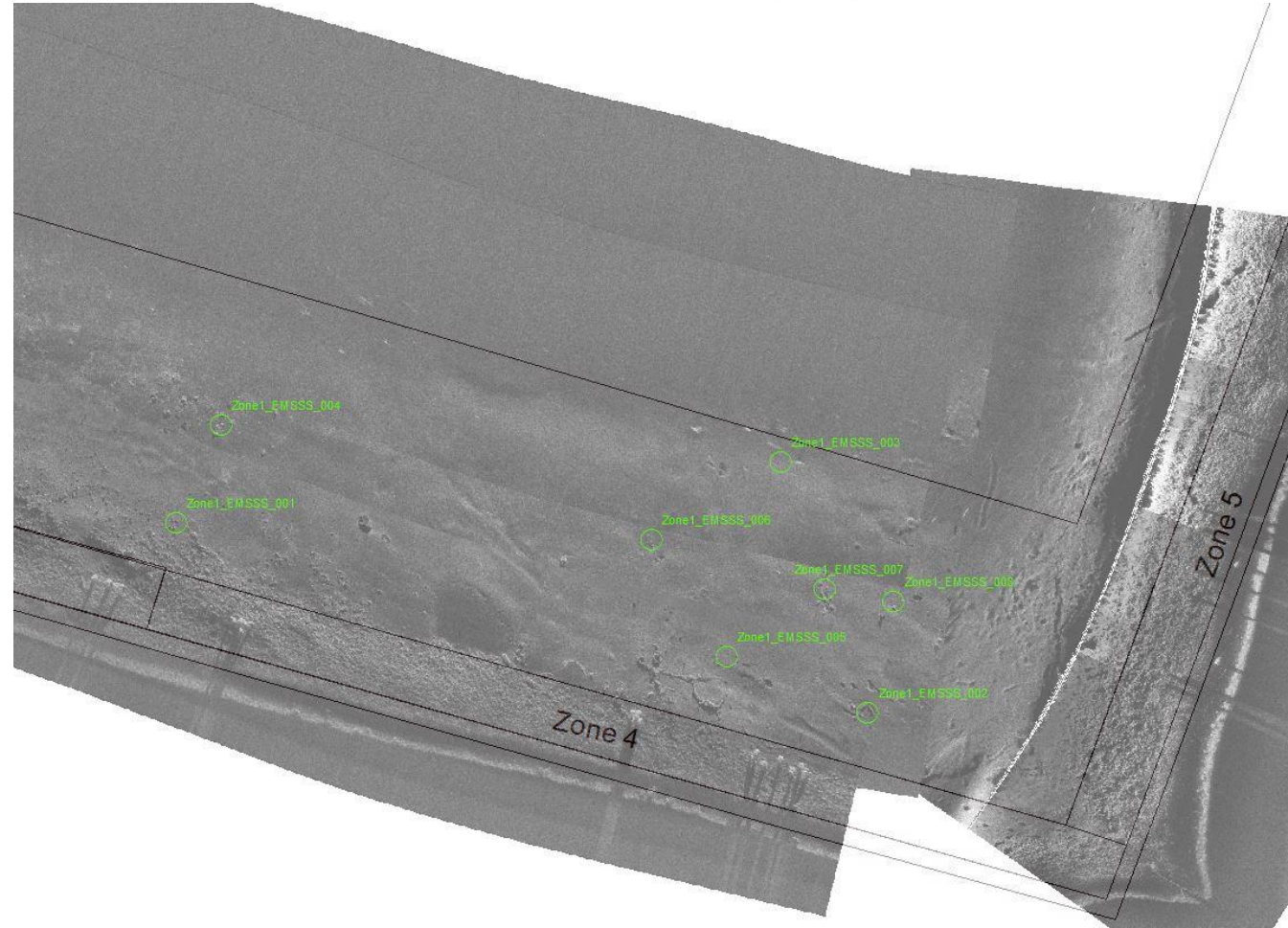
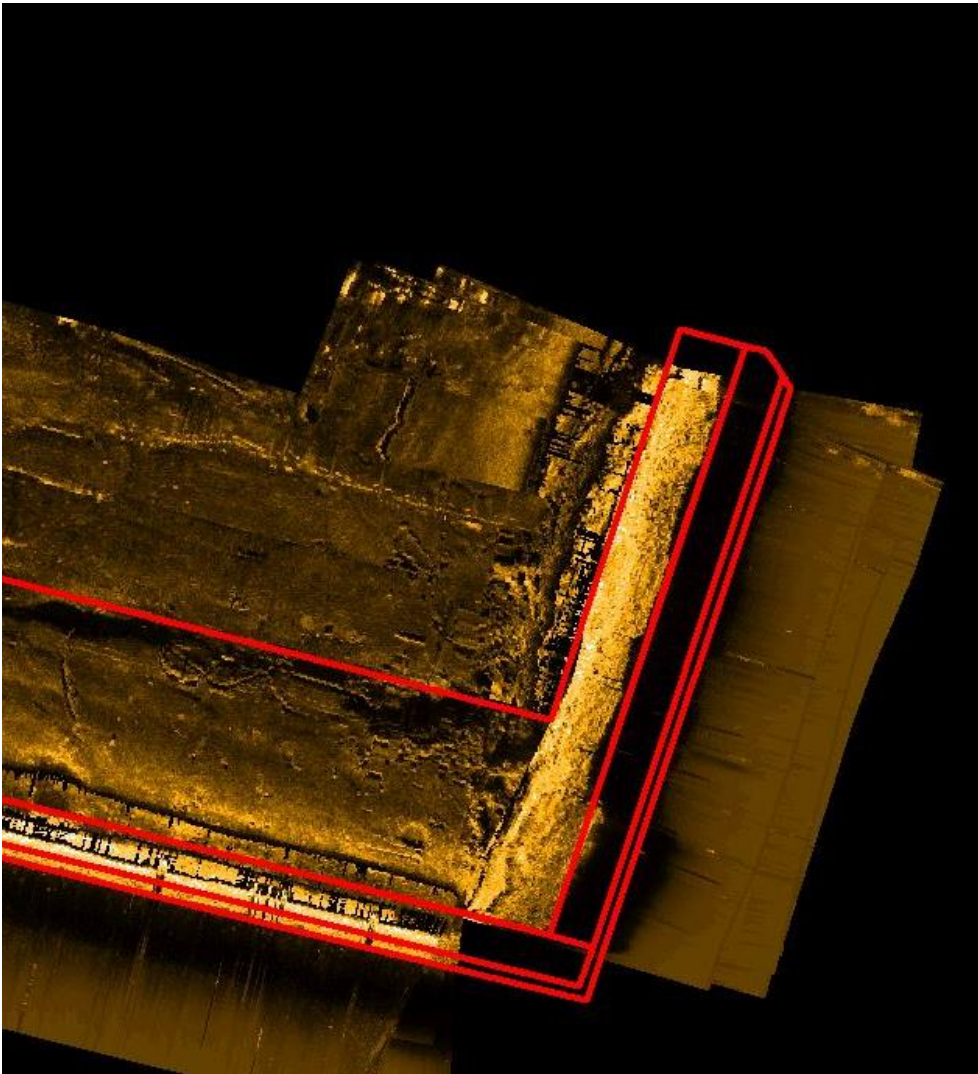
- Magnetic Field Strength (nT)
72.6
- Calculated Weight (Kg)
134.9
- Distance of sensor/target (m)
3.2

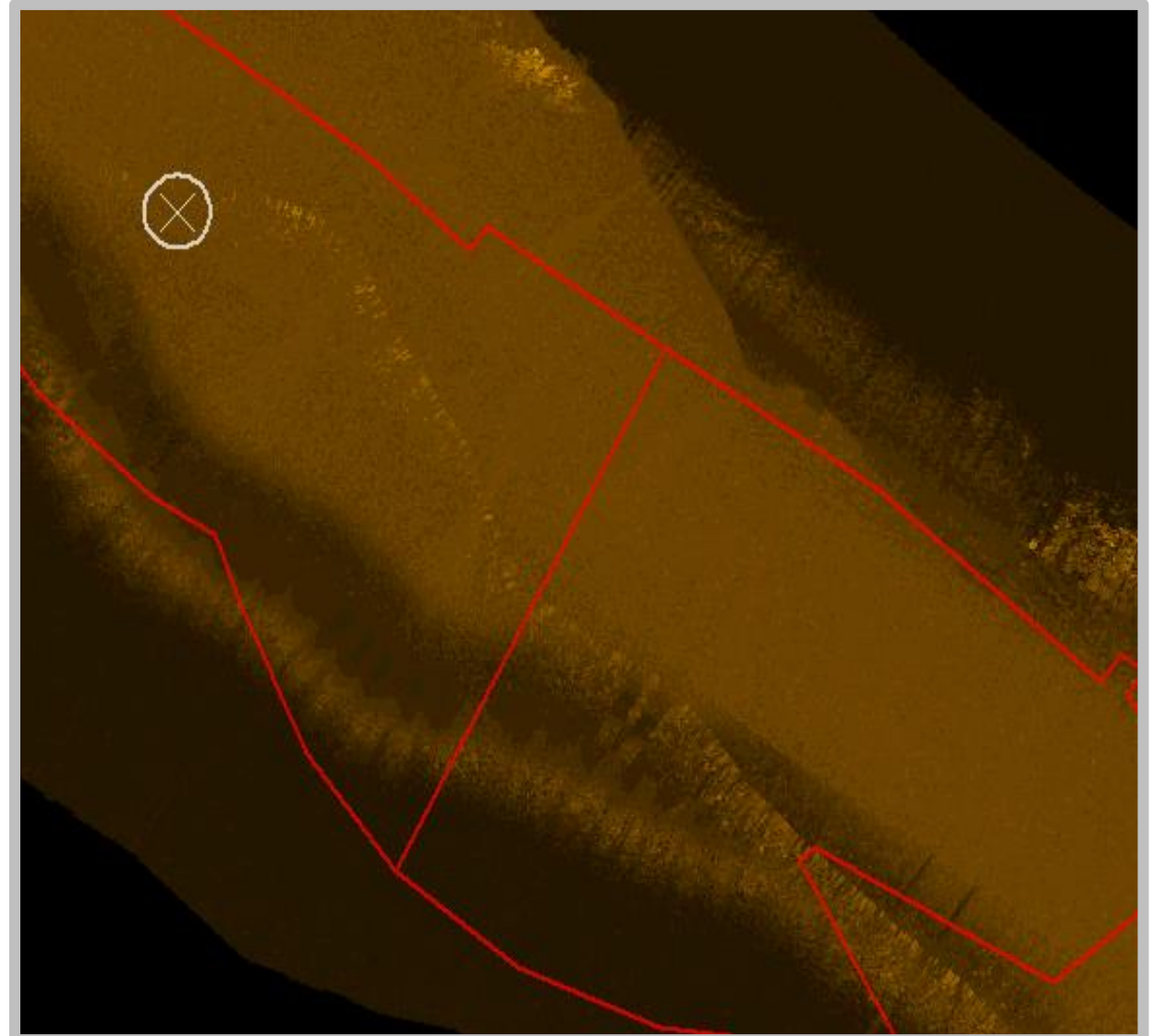
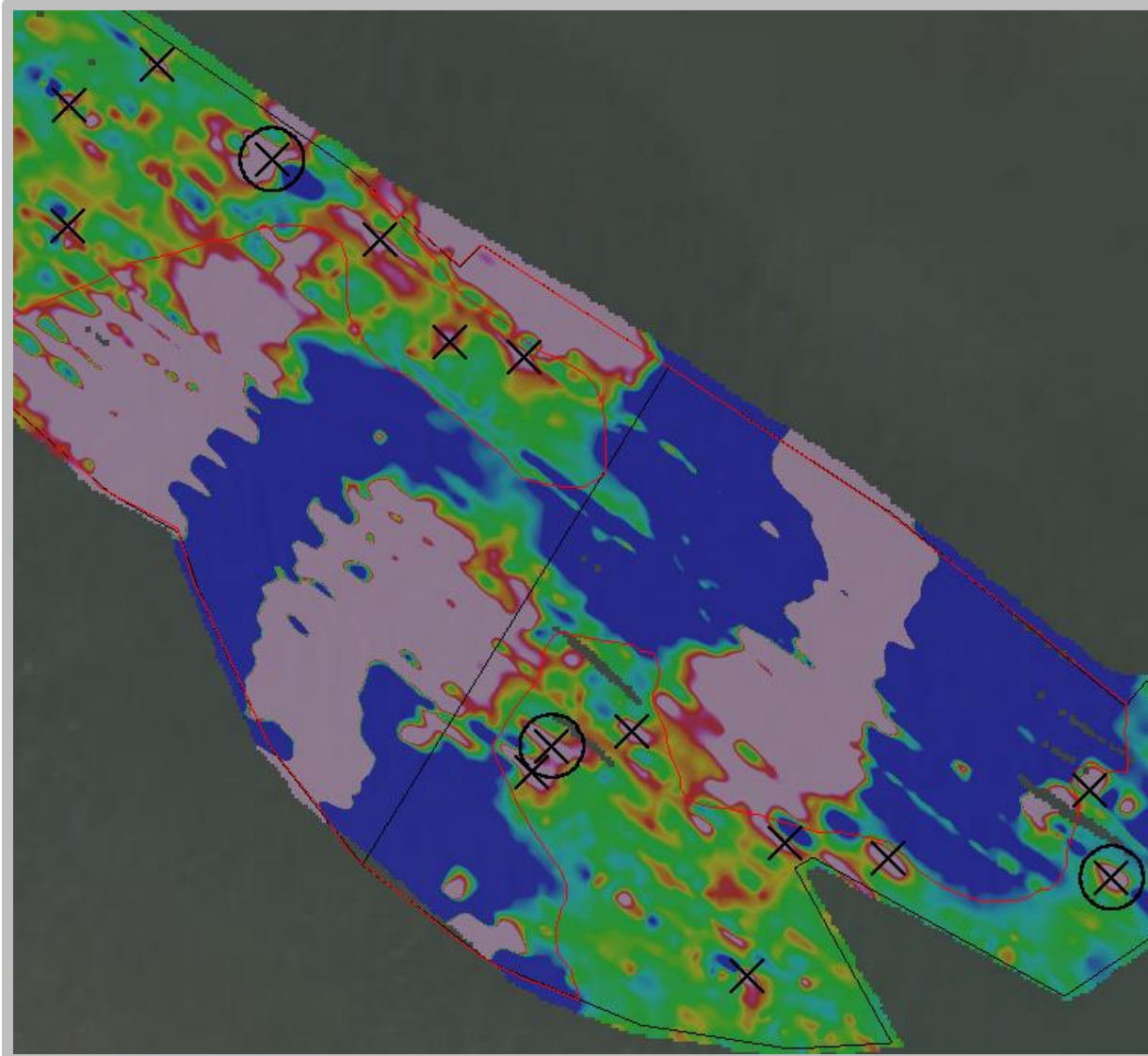


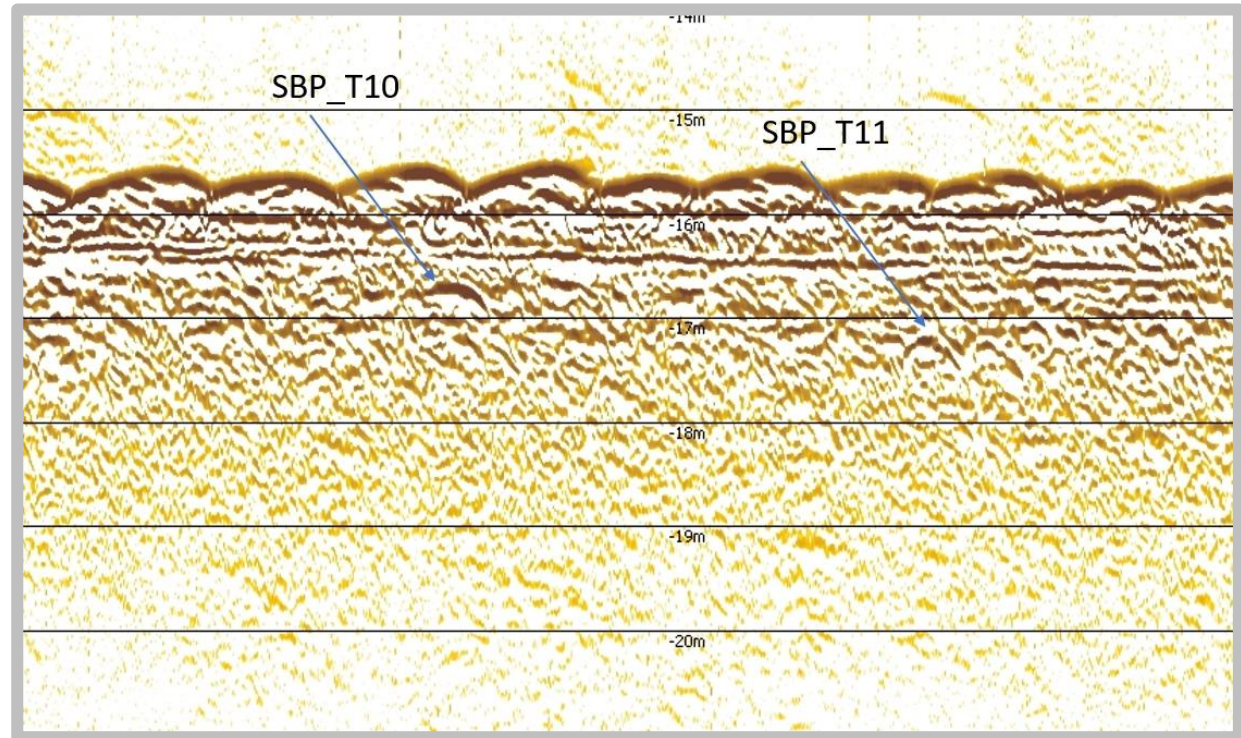
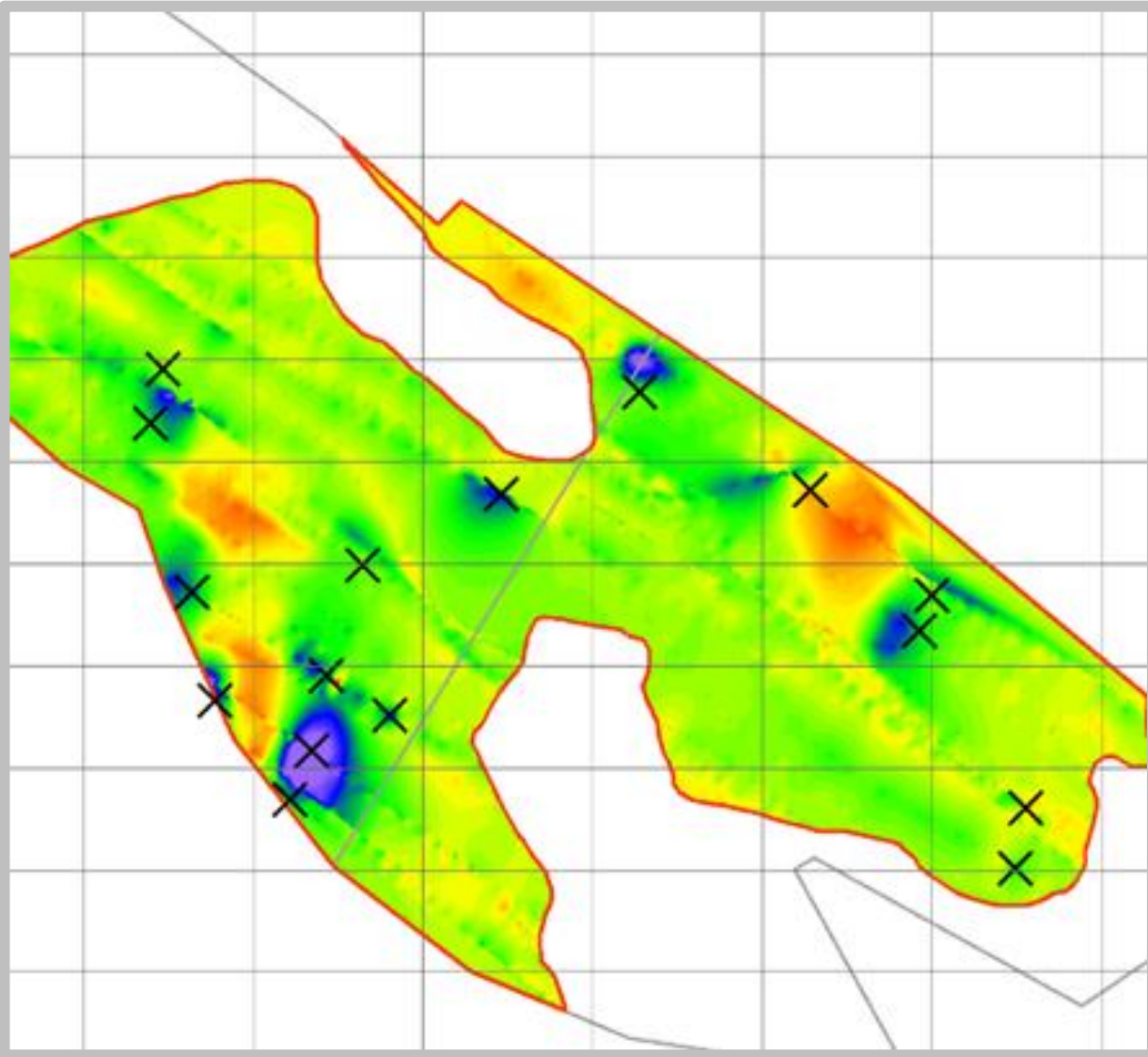
Metadata and processing information including:

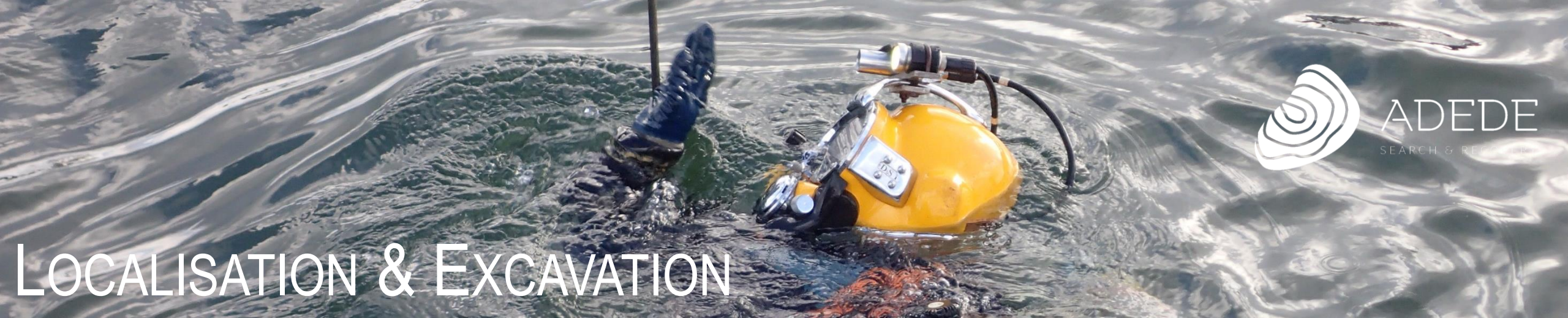
- PROJECT INFORMATION
- SYSTEM INFORMATION
- LEADERS
- LEGEND
- MAP
- PROFILES
- TABLES

The logo for ADEDE Search & Recovery, featuring a stylized swirl icon and the text "ADEDE SEARCH & RECOVERY".









LOCALISATION & EXCAVATION

LOCALISATION

= TO DETERMINE THE EXACT LOCATION OF THE DETECTED OBJECTS (X, Y, Z) BY MEANS OF AN OBJECT MAP AND LIST

EXCAVATION

= TO UNCOVER THE OBJECT BY MEANS OF LAYER-WISE EXCAVATION

LOCALISATION & EXCAVATION. MAGNETOMETRY & AIRLIFT.

- LOCALISATION: 2 SCENARIOS
 - DIVER WITH MAGNETOMETER
 - MAGNETOMETER MOUNTED ON AIRLIFT
- EXCAVATION BY MEANS OF AIRLIFT



LOCALISATION



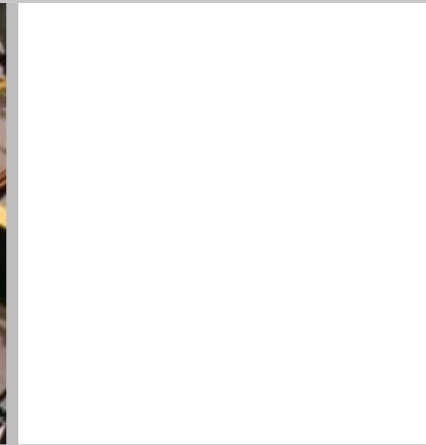
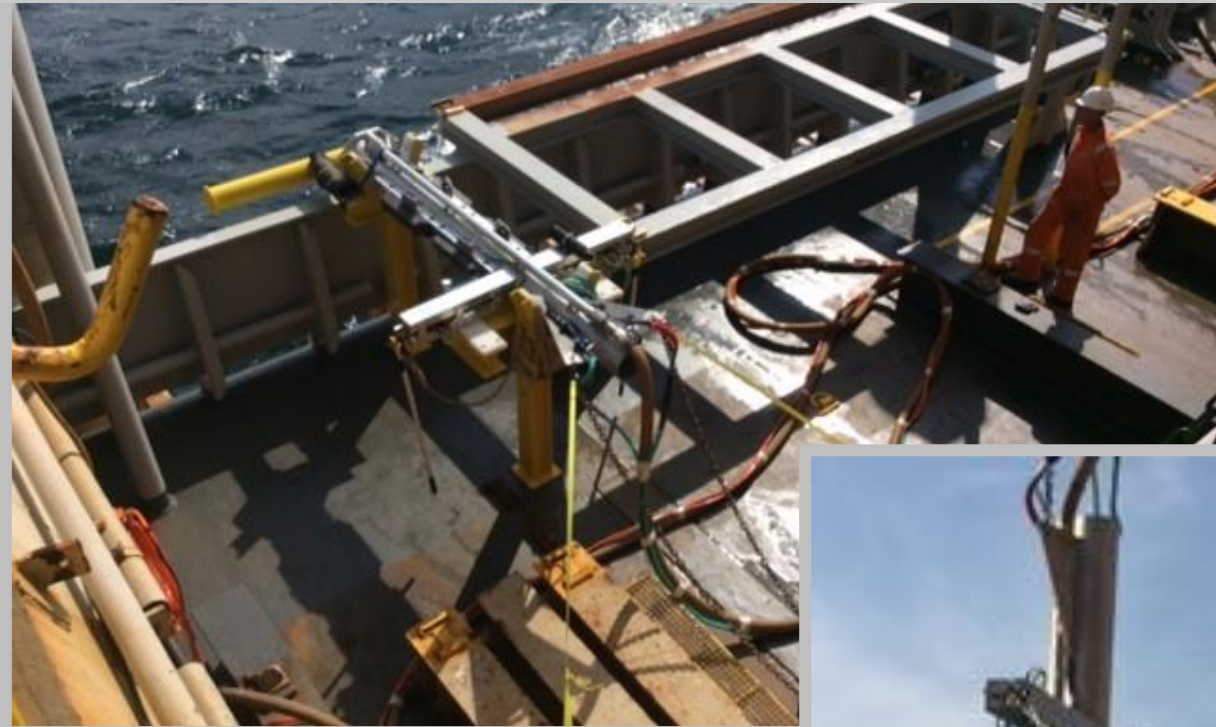
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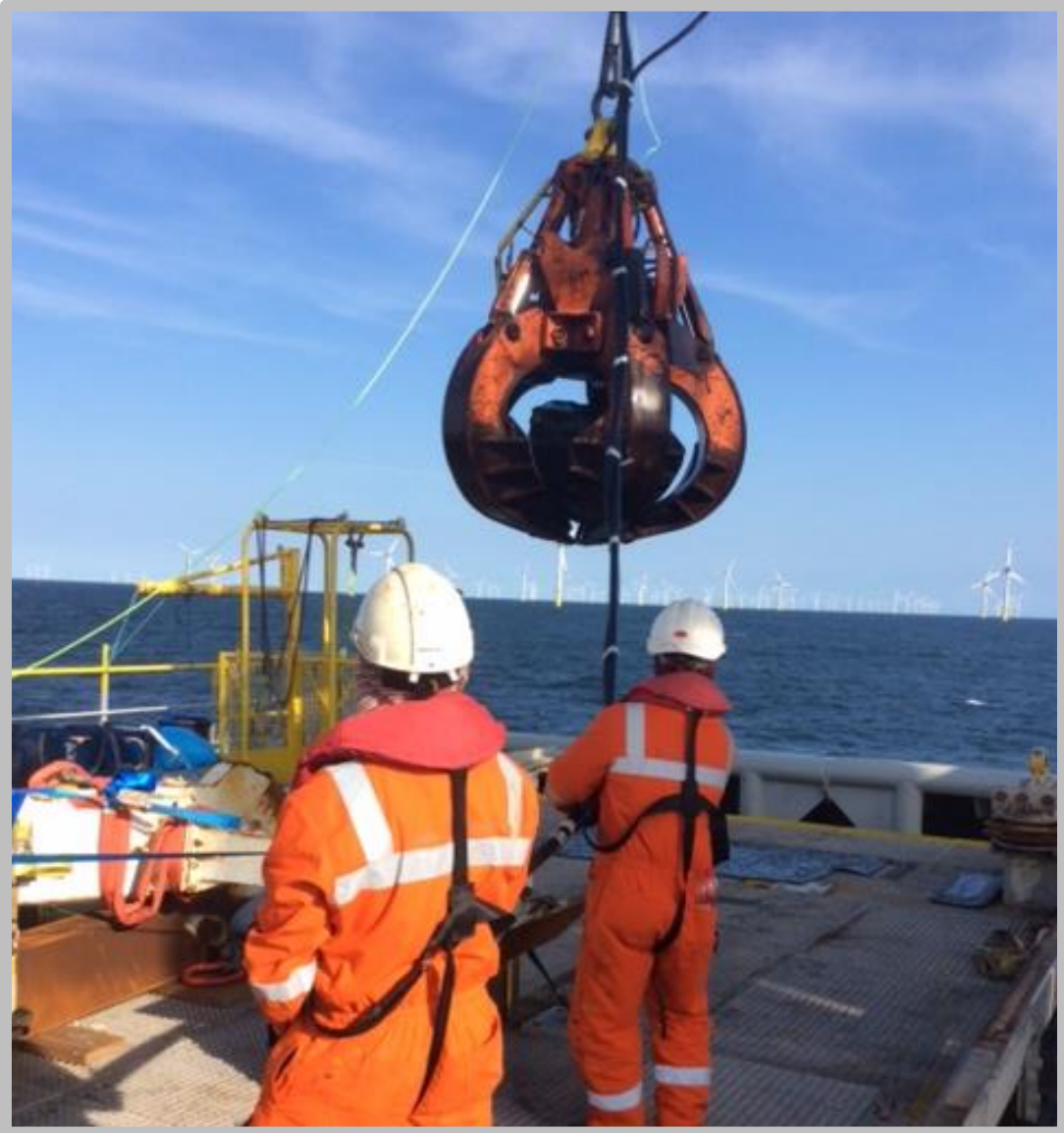
EXCAVATION



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EXCAVATION



04/10/2015 08:56:39

CAM 1



PLAY

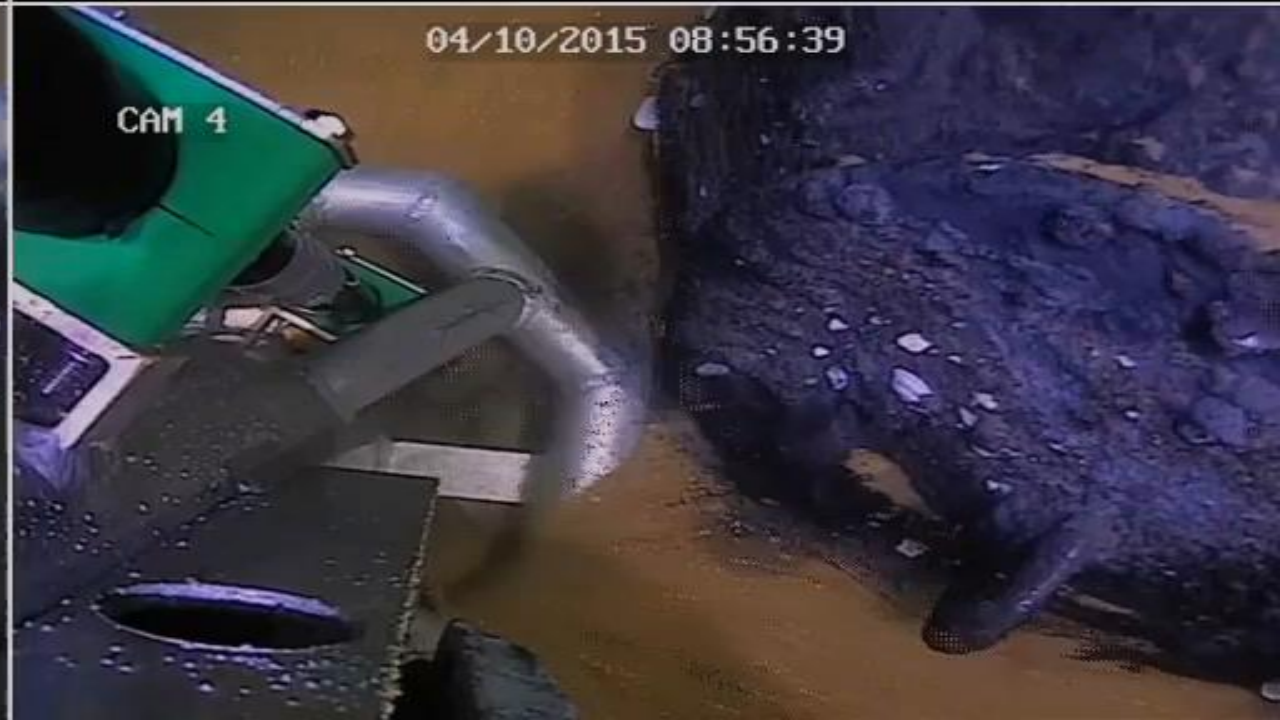
04/10/2015 08:56:39

CAM 3



04/10/2015 08:56:39

CAM 4





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IDENTIFICATION

= TO DETERMINE WHETHER THE EXCAVATED OBJECTS ARE IN FACT UXO AND IF SO, TO DETERMINE THE AMOUNT, TYPE, SUB-TYPE, WHETHER OR NOT A DETONATOR IS ARMED, CALIBER AND NATIONALITY.



TEMPORARY STORAGE & TRANSFER TO AUTHORITIES

TEMPORARY STORAGE FOR SAFE-KEEPING

= ALL ACTIVITIES AFTER TARGET INVESTIGATION, VERIFICATION AND IDENTIFICATION THAT ARE NECESSARY TO CONTROL THE RISK OF THE UXO IN RELATION TO ITS ENVIRONMENT UP UNTIL THE POINT OF TRANSFER TO AUTHORITIES, WITHOUT PERFORMING ACTIONS ON THE UXO ITSELF

TRANSFER TO AUTHORITIES

= TRANSFER OF UXO TO EOD

E.G. IN THE NETHERLANDS = EODD (= EXPLOSIEVEN OPRUIMINGSDIENST DEFENSIE)



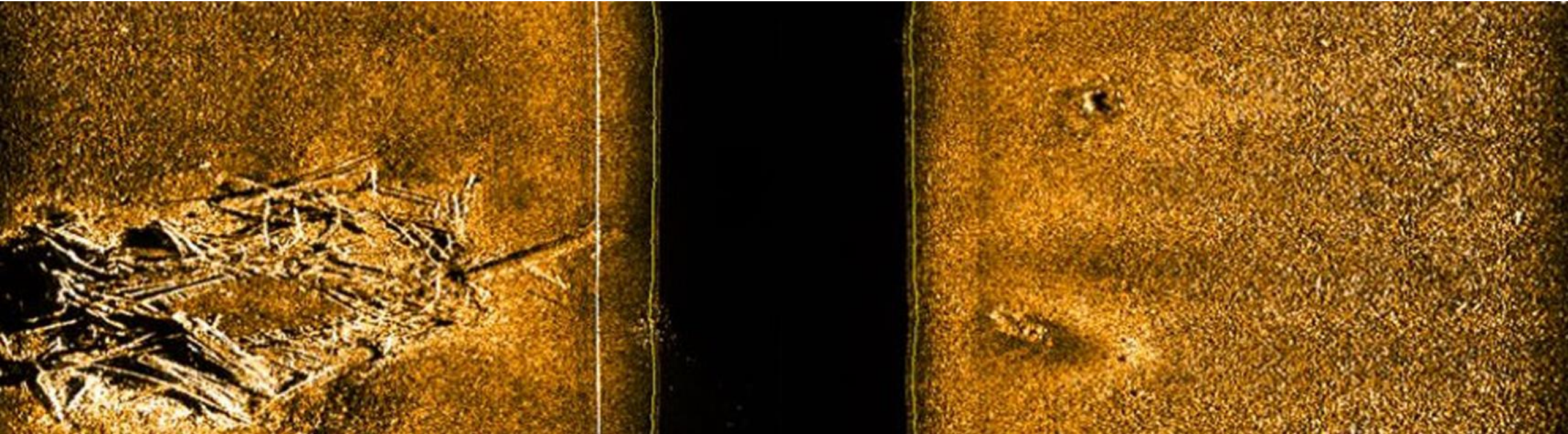
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FEEDBACK

- 🚫 MAINTAINING OBJECT LIST
- 🚫 COMPARISON BETWEEN ANOMALY AND OBJECT
- 🚫 UPDATING DATABASE
- 🚫 REPORT TO CLIENT



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