Netherlands Enterprise Agency

Webinar UXO Desk Study Hollandse Kust (west) Wind Farm Zone

8 October 2020

Matté Brijder

Welcome

- Introduction of the webinar
- Presentation of UXO Desk Study by Thomas Kloosterman (REASeuro)
- Chat for questions by expert Bart Moonen (REASeuro)

Netherlands Enterprise Agency

REASeuro

UXO Desk Study HKWWFZ

Unexploded Ordnance (UXO) - Desk Study
Commissioned by RVO

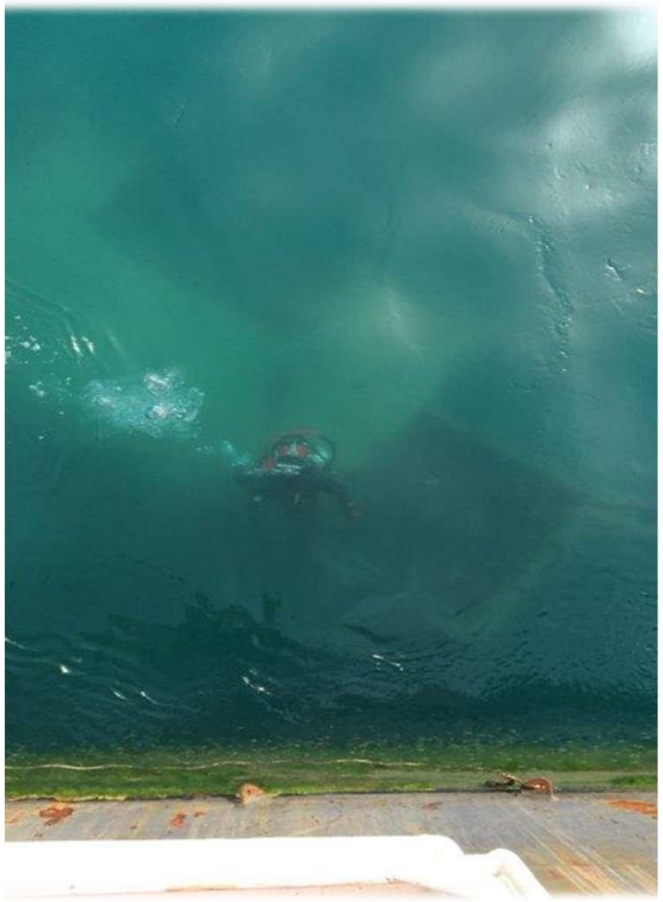
Thomas Kloosterman
Bart Moonen

Webinar 8 October, 2020

Contents

1. Introduction to REASeuro

- Specialized on all issues regarding UXO
- Dutch, Belgian and German branches
- Onshore UXO clearance operations
- Offshore UXO clearance operations
- EOD management
- Education on UXO and IED threats



1. Introduction to REASeuro

2. Main objectives risk assessment

- Identification of UXO related constraints
- Establishing high risk areas where activity should be avoided
- Identification of requirements from UXO perspective for:
  - Determining concession zones
  - Safe geophysical and geotechnical investigations
  - Safe installation of foundations and cables

3. Historical research

- Conducted according the WSCS-OCE guidelines
- Information drawn from:
  - Information derived from RVO.nl
  - Literature
  - Archives (NL, UK, GER, USA)
  - Dutch Coastguard & the Royal Netherlands Navy
  - Open source information

3. Historical research

Maritime warfare on the North Sea

Naval warfare	Aerial warfare	Post war activities
Laying of mine fields	Attacks on vessels	UXO encounters
Torpedo attacks on vessels	Mine laying	
Engagement between small vessels	Bomb jettisons	
Sinking of vessels	Airplane crashes	
Shooting range (German)		

3. Historical research

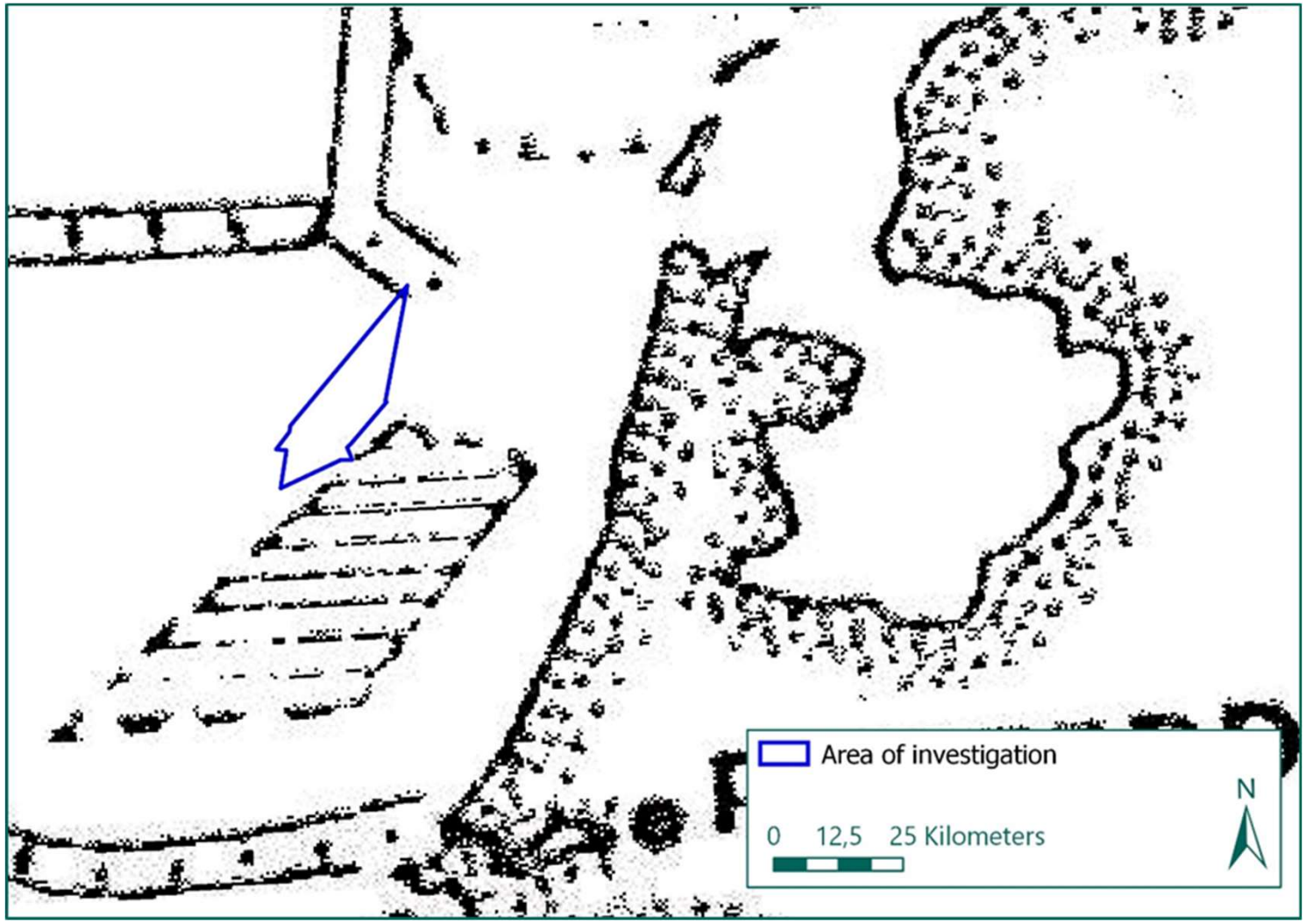
UXO encounter registration

- April 2005: UXO accident with trawler OD-1 ‘Maarten Jacob’
- Since April 2005: UXO encounters reported by fishing vessels
- UXO discarded by fishing vessels, GPS location reported
- EOD neutralizes UXO threat
- UXO not always located

REASeuro

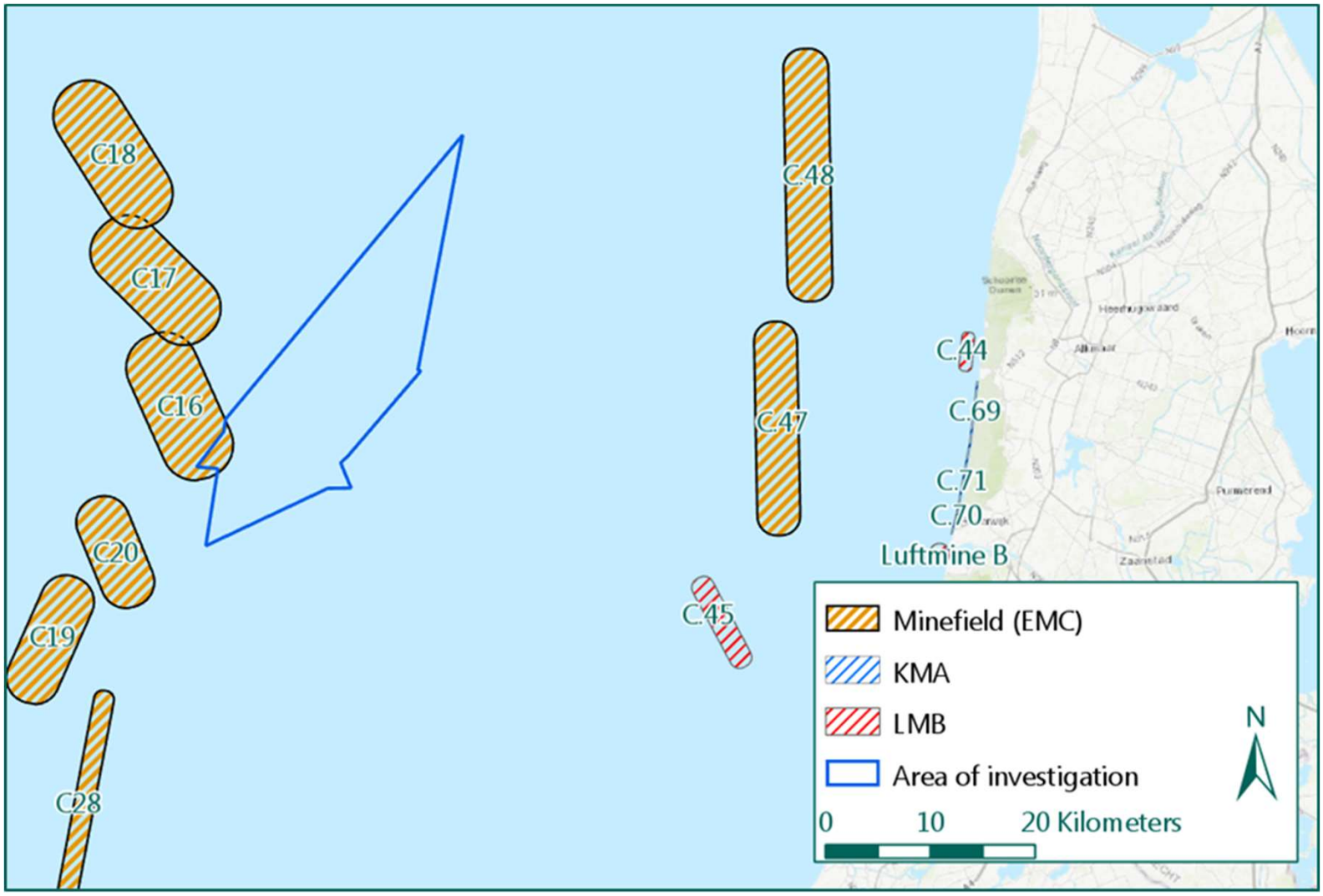
3. Historical research

German Naval mine fields World War 1



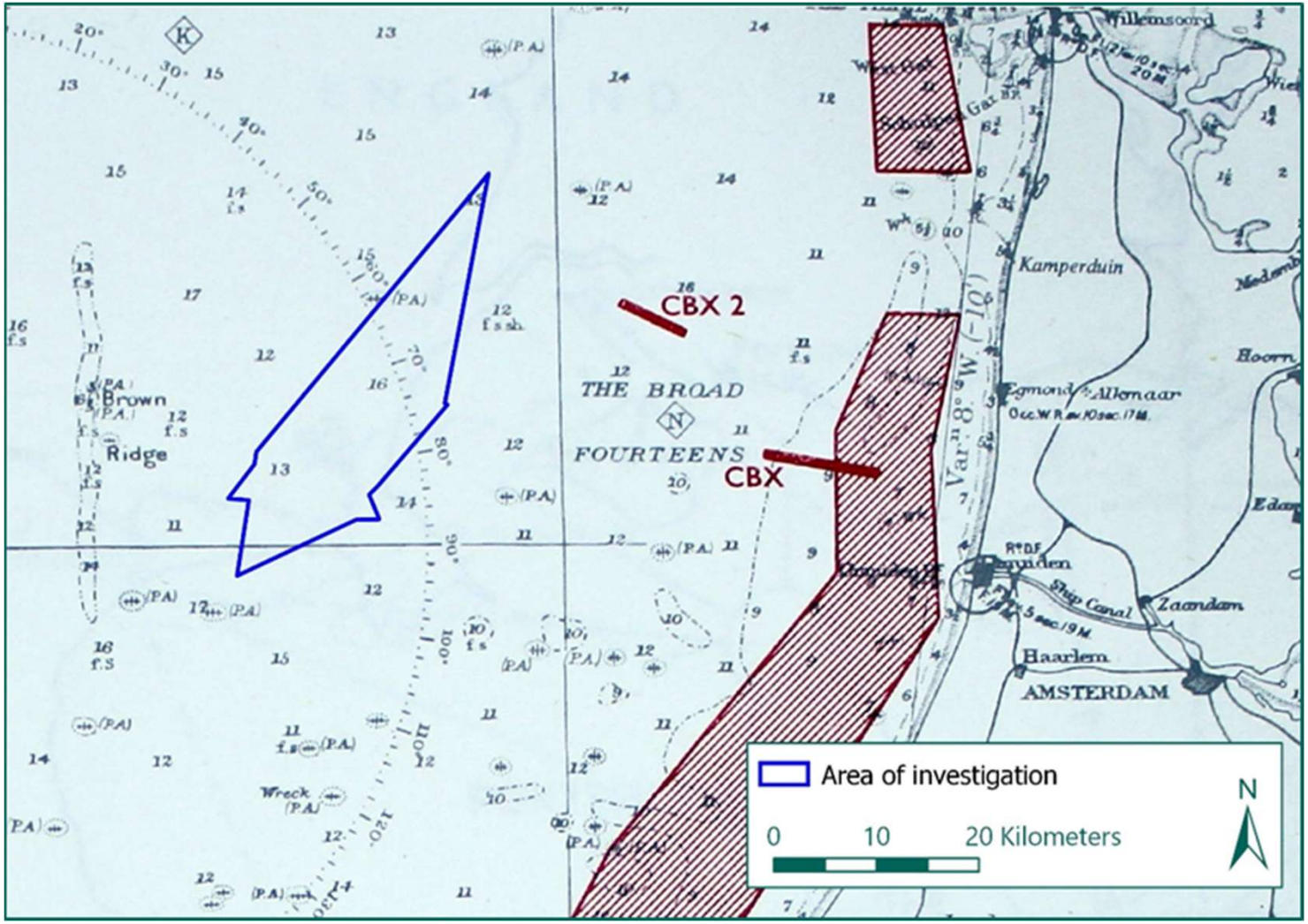
3. Historical research

German Naval mine fields World War 2



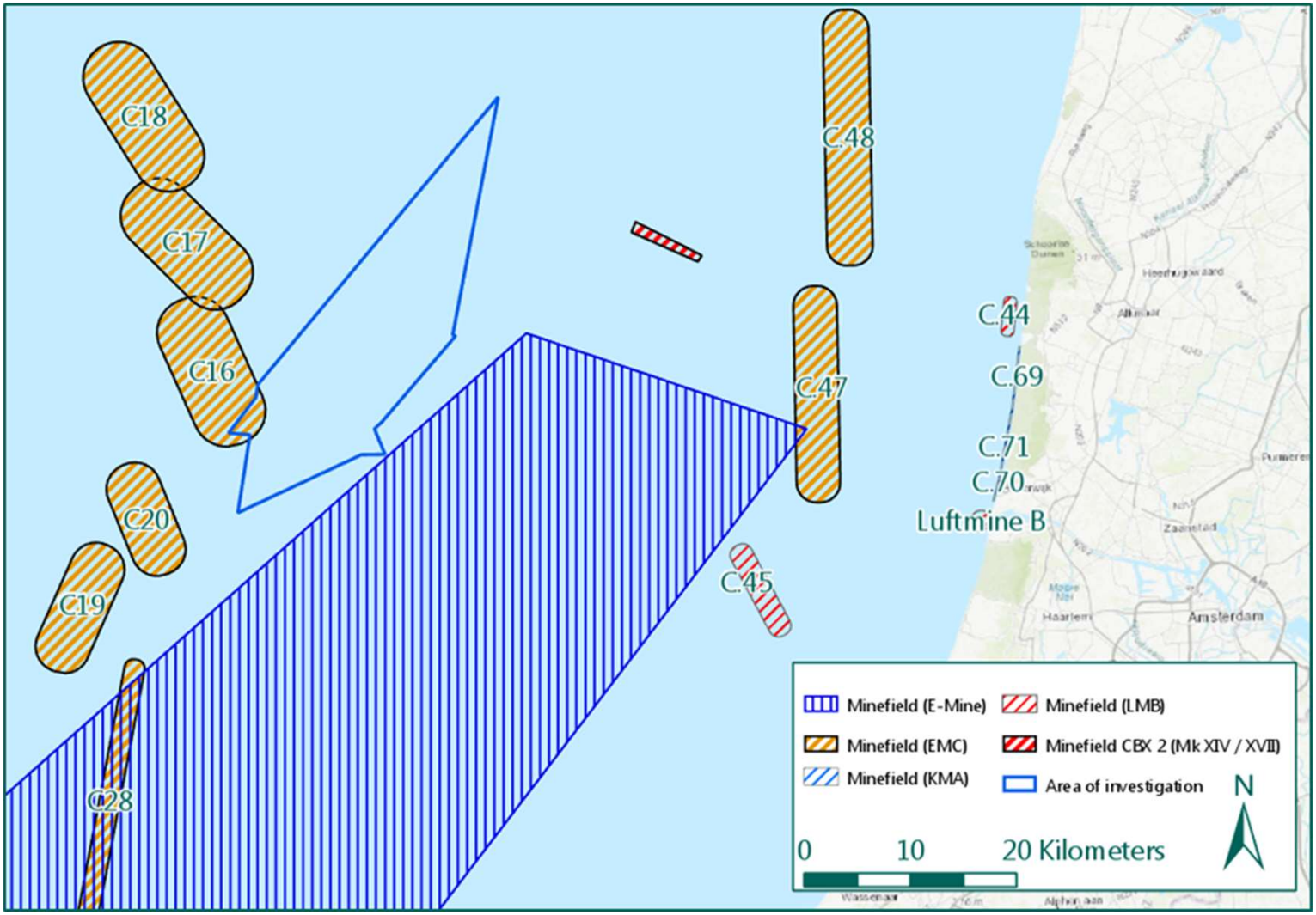
3. Historical research

Allied Naval mine fields World War 2



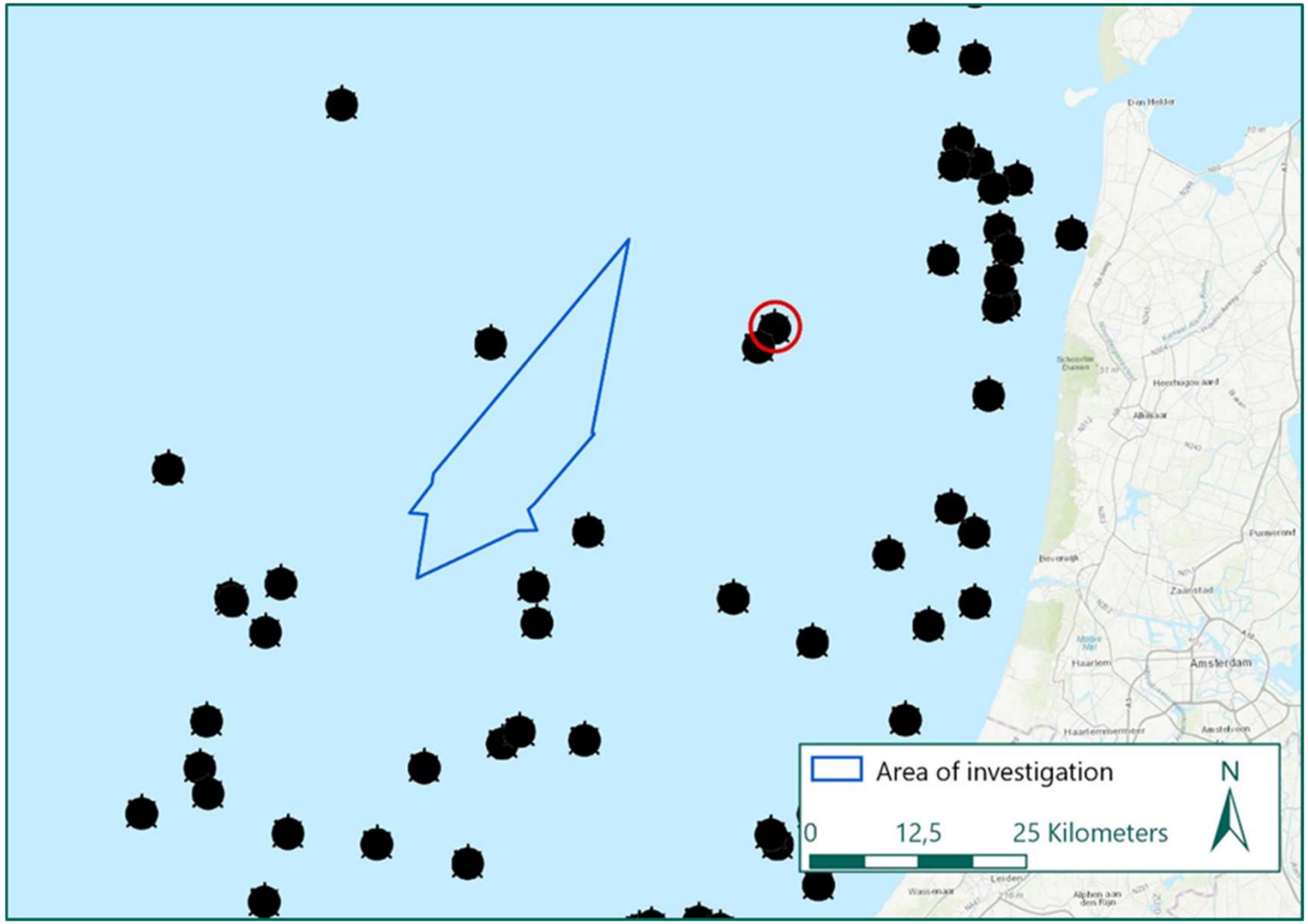
3. Historical research

Relevant minefields



3. Historical research

Post-war mine encounters (since 2005)



3. Historical research

Aerial attacks

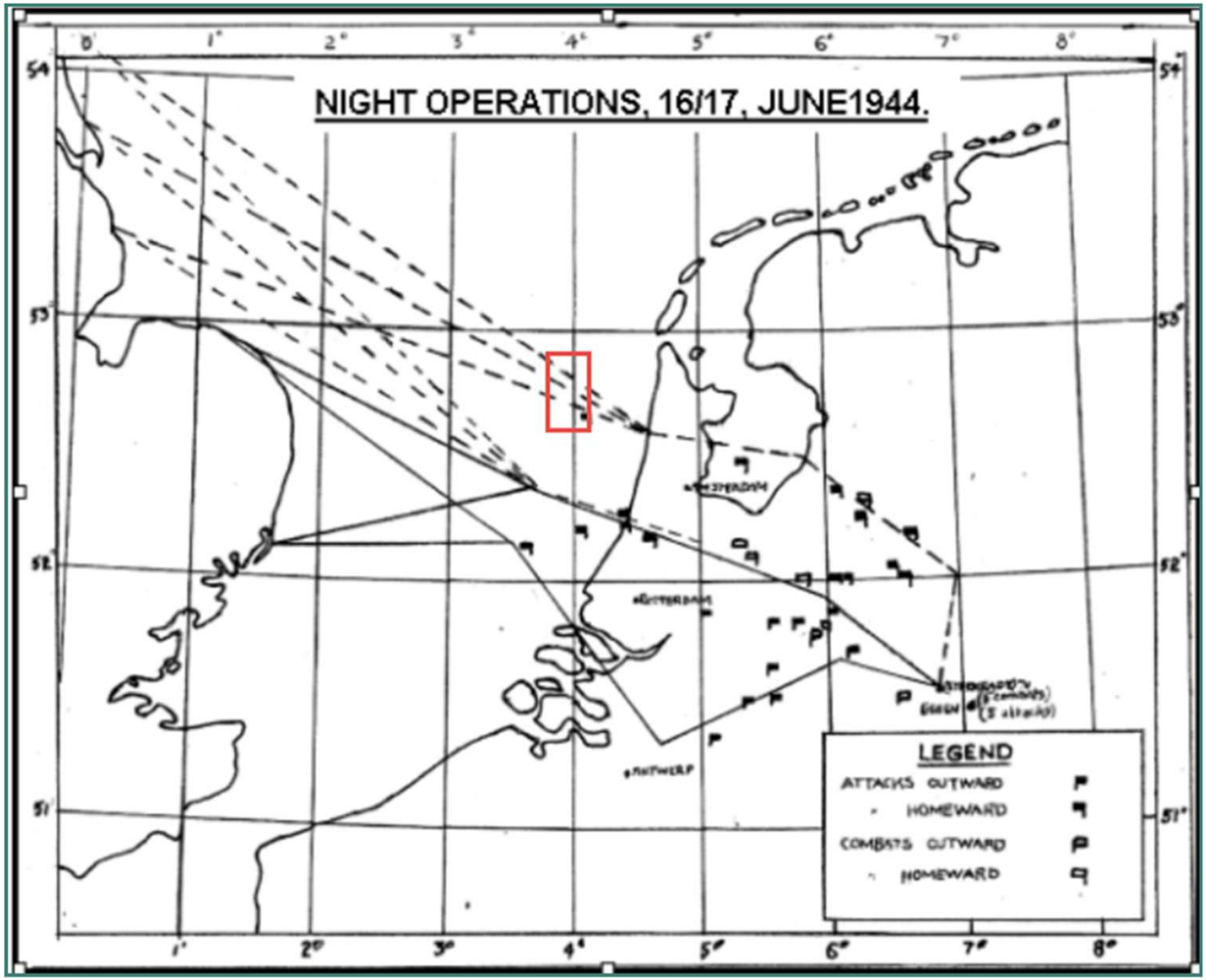
3. Historical research

Aerial attacks

- Onboard cannons (20 mm) and machineguns
- Torpedoes
- Rockets (RP3, 60 lbs warheads)
- Bombs
- Depth charges (anti-submarine warfare)

3. Historical research

Jettisons and crashes



3. Historical research

Jettisons and crashes

- Payload often armed upon departure
- Aircraft forced to return (poor weather, damage, failed to find suited target)
- Too dangerous to land with active payload
- Payload jettisoned above North Sea
- Aircraft crashes
- No specific locations

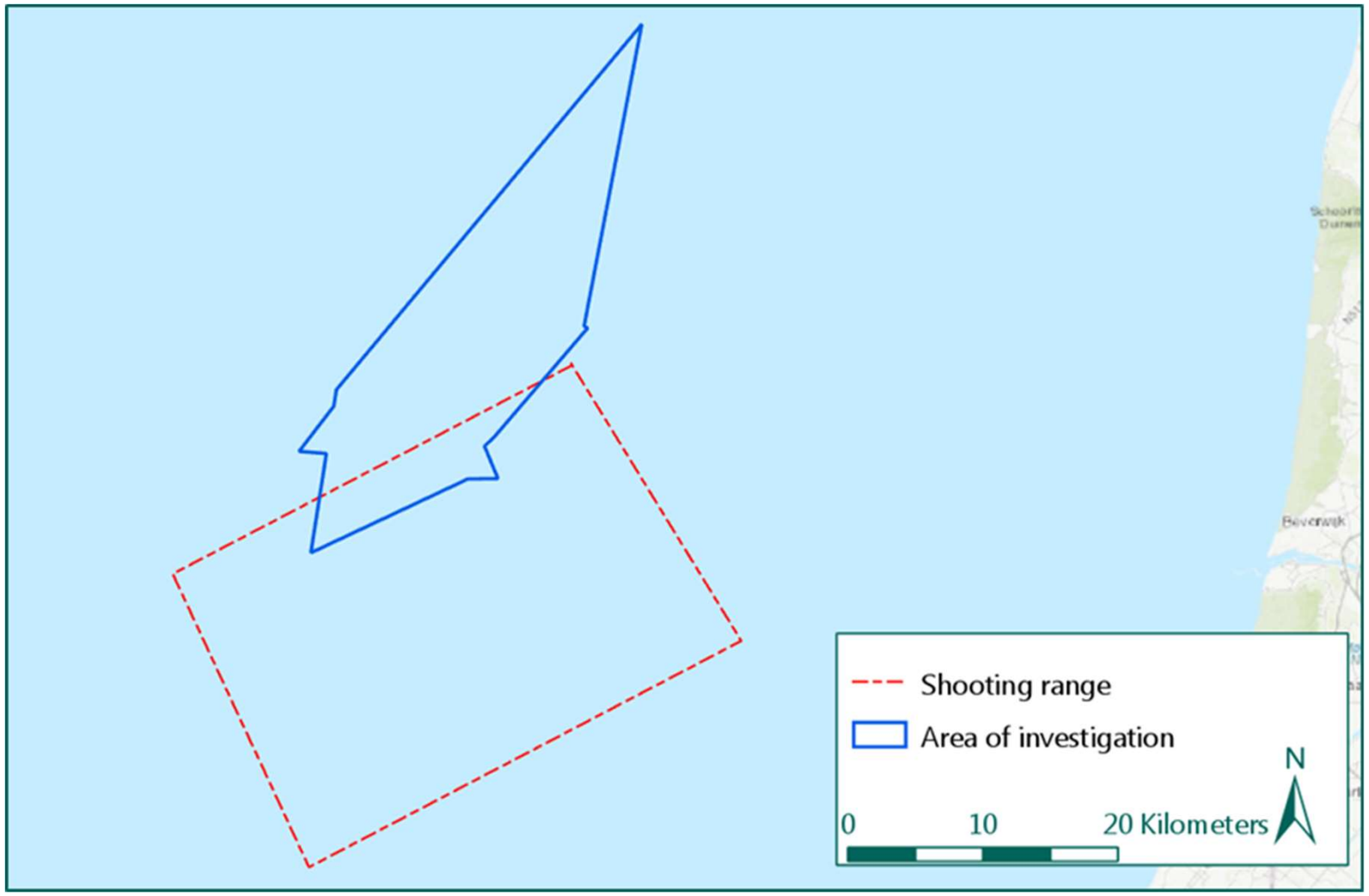
3. Historical research

Aerial attacks, jettisons and crashes conclusions

- Ships and convoys were attacked on a regular basis
- Bombs, rockets, depth charges and torpedoes were used
- Several airplane crashes were reported
- Payload was often jettisoned into sea
- Aerial bombs represent >50% of all UXO encounters

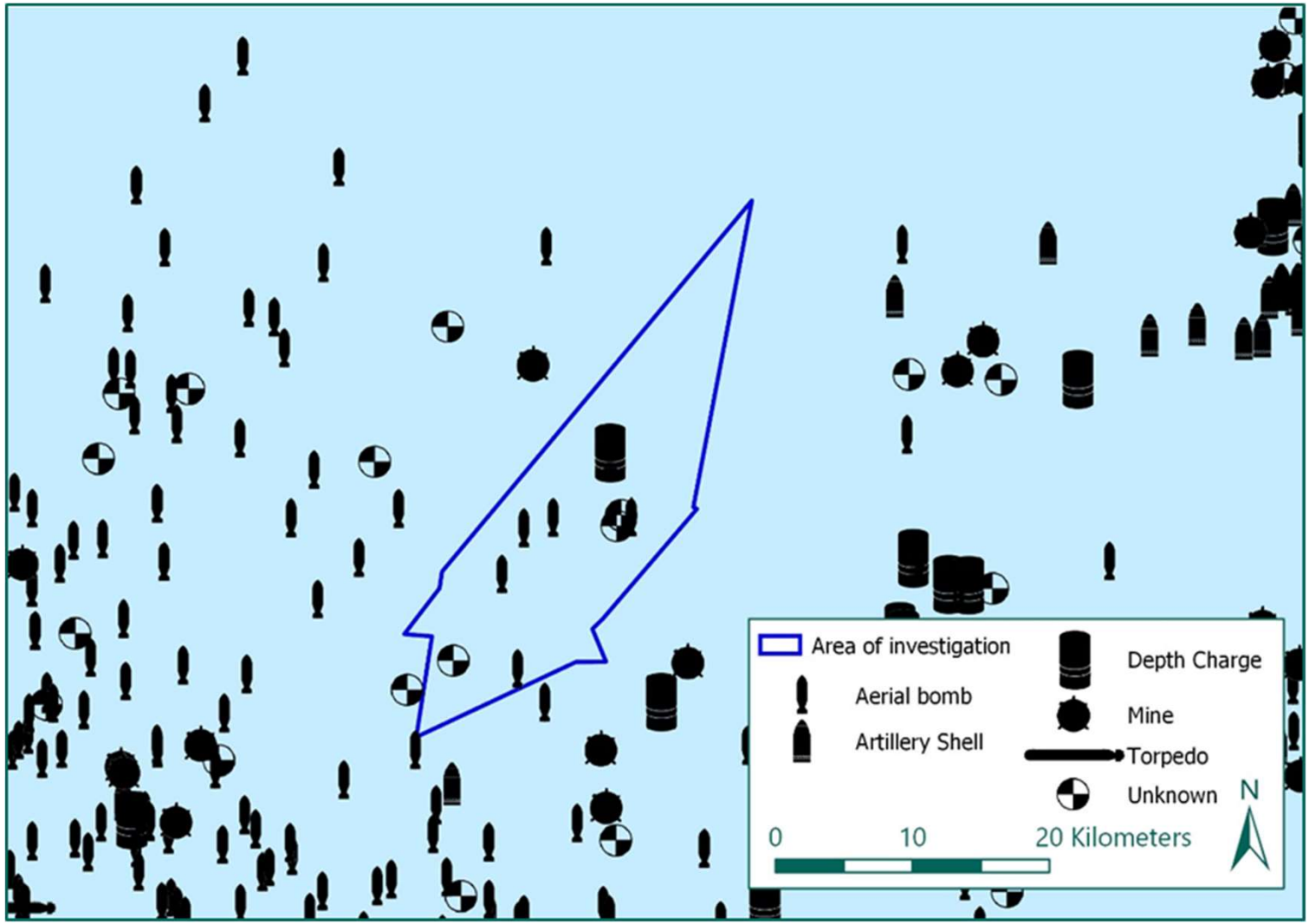
3. Historical research

German shooting area (practice)



3. Historical research

Post-war UXO encounters (since 2005)



3. Historical research

Conclusions

The Hollandse Kust (west) Wind Farm Zone is to be considered a UXO risk area because:

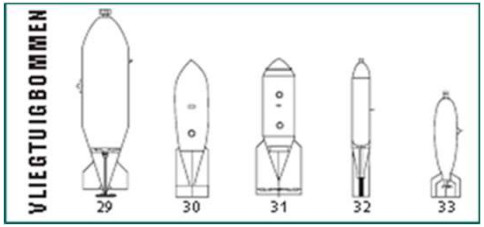
- Several mine fields were present in the area
- Ships and convoys were attacked with bombs, torpedoes, depth charges and cannons
- Allied airplanes were attacked by German fighters and AA weapons, resulting in large amounts of airplanes crashing into the North Sea.
- The payload of allied airplanes was often jettisoned in the North Sea
- Since April 2005 several UXO were encountered within the Wind Farm Zone

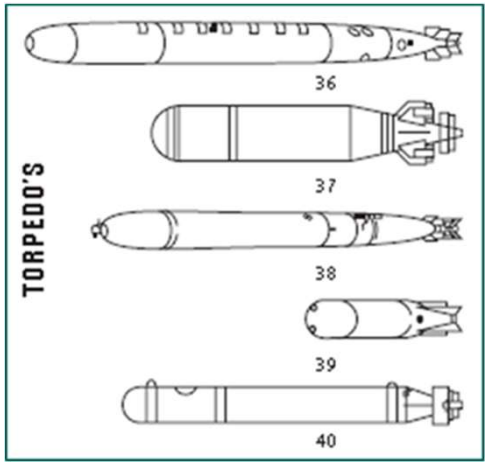
3. Historical research

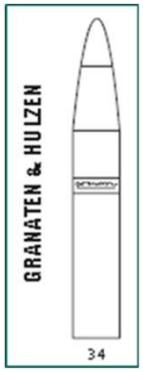
Conclusions

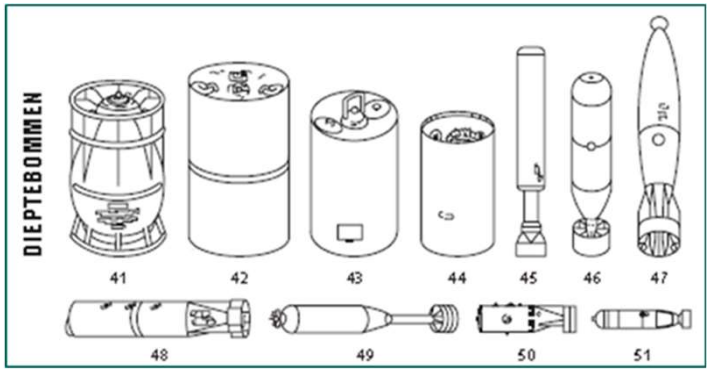
The following UXO are possibly left behind in the area:

- Naval mines
- Air dropped bombs
- Torpedoes
- Depth charges
- Artillery shells
- Rockets









4. UXO risk assessment

Fact summary

- All encountered targets and positively identified UXO must be considered armed and dangerous
- Most UXO have a large Net Explosive Quantity
- Intrusive activities will be needed for wind farm development
- This may cause a fuze to function, leading to a detonation
- Personnel may be harmed and equipment may be severely damaged
- A detonation may form an intolerable risk for personnel and/or equipment
- UXO risk mitigation measures are needed

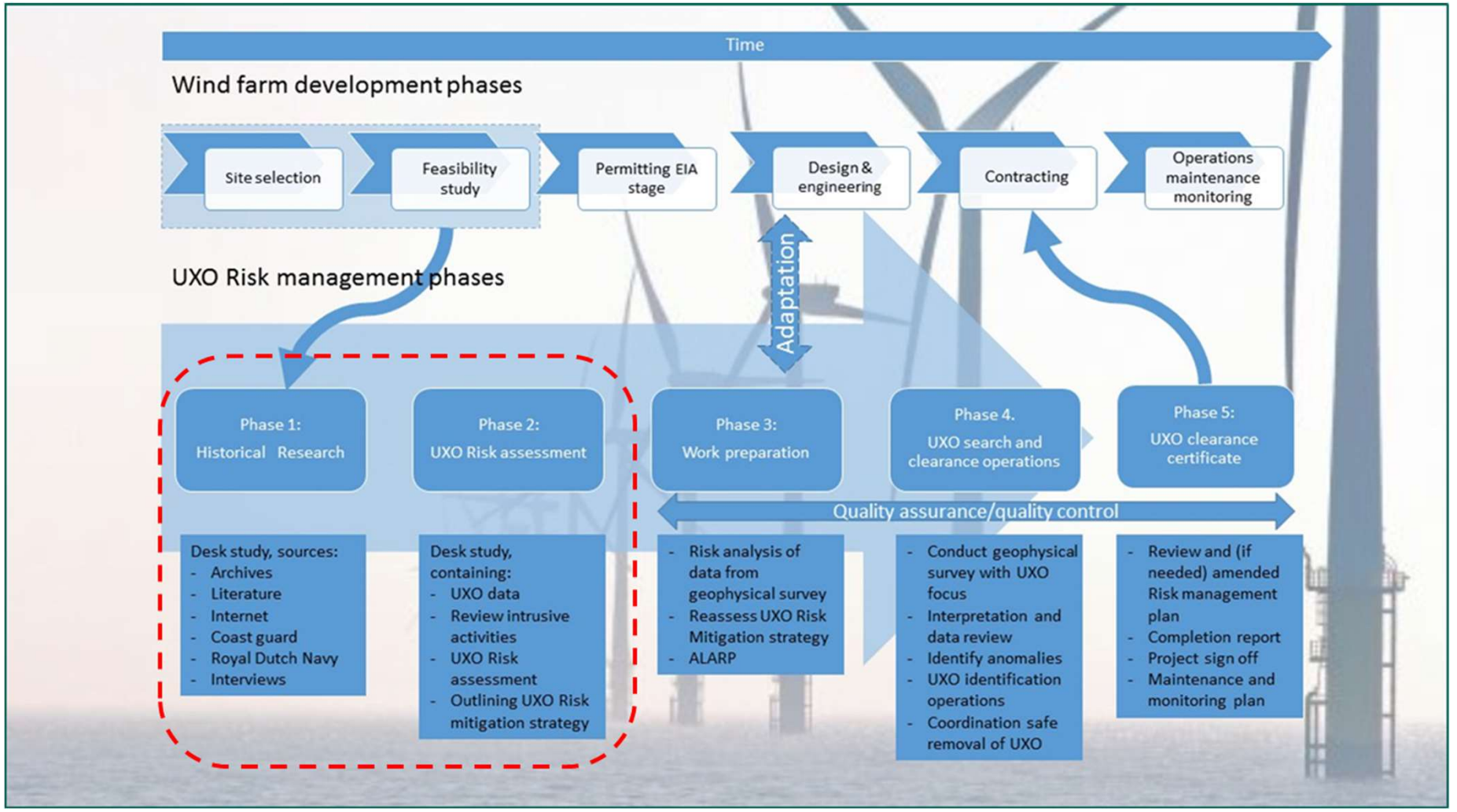
4. UXO risk assessment

Effects of under water detonations

Effect	Likelihood	Reason
Direct damage	Unlikely	Direct contact between vessels and UXO is not to be expected
Bubble jet effect	Likely	Dependent on the distance of vessels to the detonation point
Shock	Likely	Dependent on the distance of vessels to the detonation point
Shredding	Feasible	Divers can be affected up to 2,700 m of the detonation point
Fragmentation	Unlikely	Unlikely that lethal fragments are ejected above the surface of the water

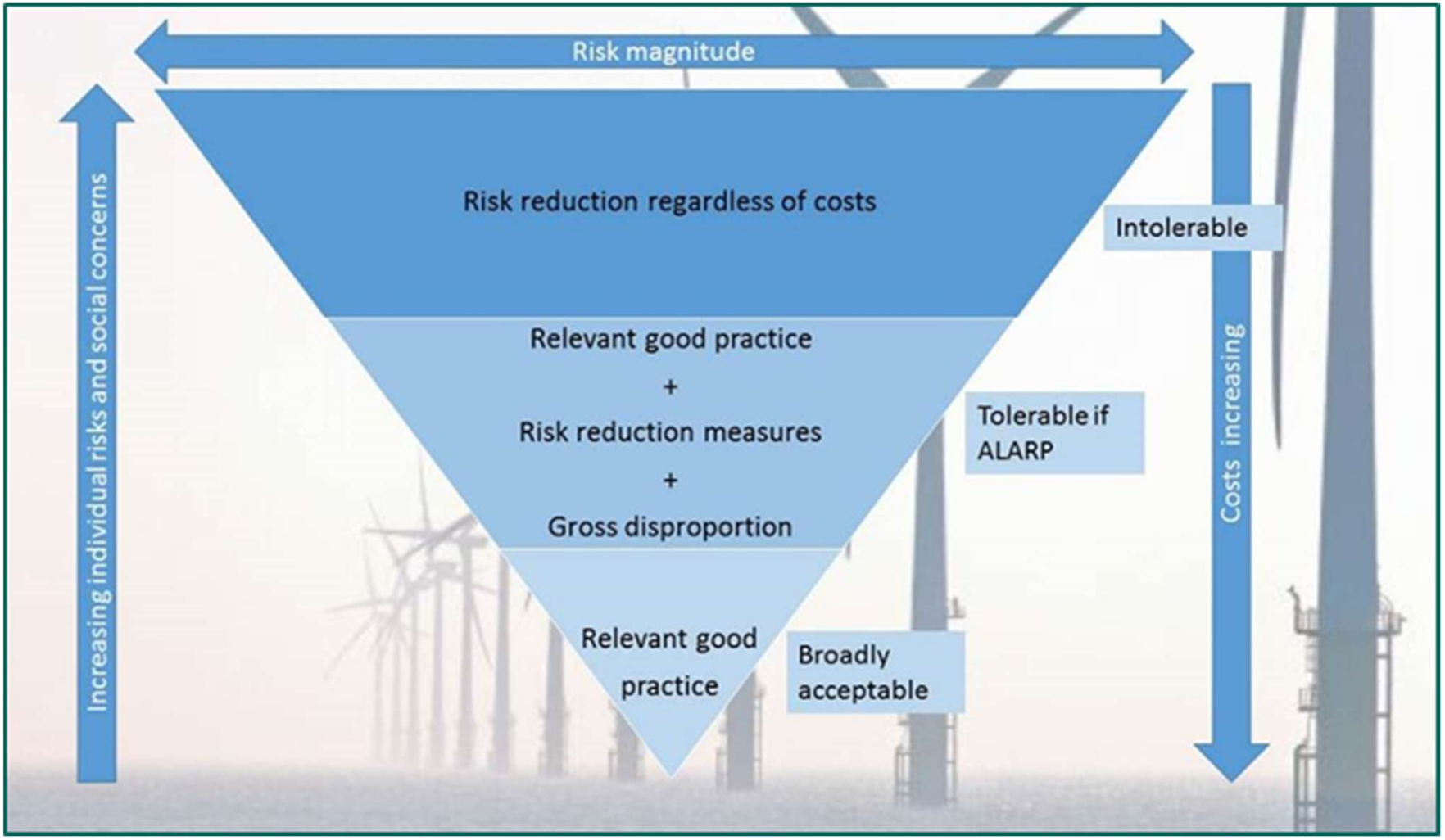
4. UXO risk assessment

UXO mitigation strategy



4. UXO risk assessment

UXO ALARP certification



4. UXO risk assessment

UXO mitigation strategy

1. General awareness on UXO within all participants
2. ALARP assessment based on the Desk Study, environmental site data and further UXO related information in order to determine the threshold criteria
3. Determination UXO geophysical survey design derived from and based on the ALARP risk assessment
4. Determination survey areas around wind turbine locations and cable routes
5. Implementation of the UXO geophysical survey

4. UXO risk assessment

UXO mitigation strategy

6. Evaluation of UXO geophysical survey data and determination of targets to be avoided or identified in accordance with defined threshold criteria
7. Identification of targets with ROV and/or divers and qualified personnel
8. Removal of non-UXO objects identified (as required)
9. Disposal of identified UXO by the Netherlands EOD authority
10. Preparation and issuing of documentation and UXO sign-off certificates

4. UXO risk assessment

UXO ferrous threshold level

- Artillery shells, 20 mm shells and RP3 rockets have low NEQ and pose no threat to HKWWFZ operations
- 250 lbs aerial bomb smallest UXO that poses a threat
- 250 lbs aerial bombs ferrous mass between 50-83 kg depending on make, model and condition
- 50 kg lowest ferrous threshold level for survey

5. Regulation and standards

- Dutch law is applicable:
  - Dutch Working Conditions Act (ARBO)
  - WSCS-OCE (annex XII of the working conditions regulation)
- Close cooperation with EOD authorities is needed (planning and execution of disposal operations)

6. Conclusions

- The entire wind farm area is to be considered a UXO risk area
- A presence of naval mines, aerial bombs, depth charges, torpedoes, rockets and artillery shells is expected
- A detonation of a large Net Explosive Quantity UXO item forms an intolerable risk for personnel and equipment
- UXO risk mitigation measures are needed
- With proper UXO risk management the risks can be reduced to ALARP

Your safety,
our concern

Netherlands Enterprise Agency

Closing the webinar

Please fill in the questionnaire

You can watch this webinar again and download the powerpoint presentation and the list with questions and answers from: https://offshorewind.rvo.nl

Thank you for participating in this webinar

All webinars about the Hollandse Kust (west) Wind Farm Zone can be found on https://offshorewind.rvo.nl