



Netherlands Enterprise Agency

Webinar Archaeological Desk Study

Hollandse Kust (west) Wind Farm Zone

15 October 2020

Peter-Paul Lebbink



Welcome

- › Introduction of the webinar
- › Presentation of Archaeological Desk Study by Bart van Mierlo (Periplus)
- › Chat for questions by expert panel: Seger van der Brenk (Periplus) and Roelant Knauff (RVO)



Archaeological investigations of the Hollandse Kust (west) Wind Farm Zone

BART VAN MIERLO

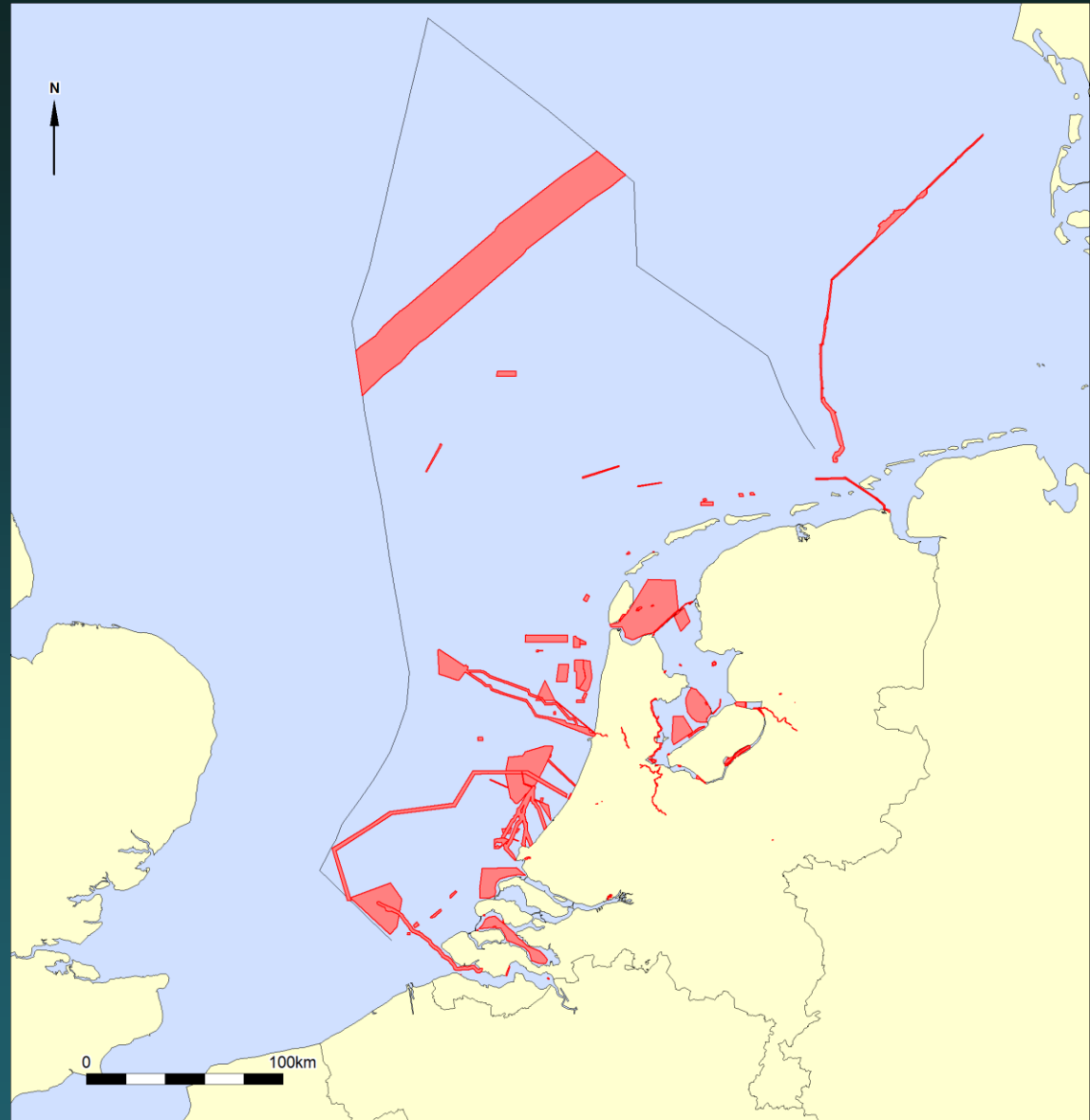
Company profile



Office in Amsterdam

Founded in 2005

> 200 projects



Introduction

- Archaeology and legislation
- Desk study
- Assessment geophysical survey
- Summary and conclusions

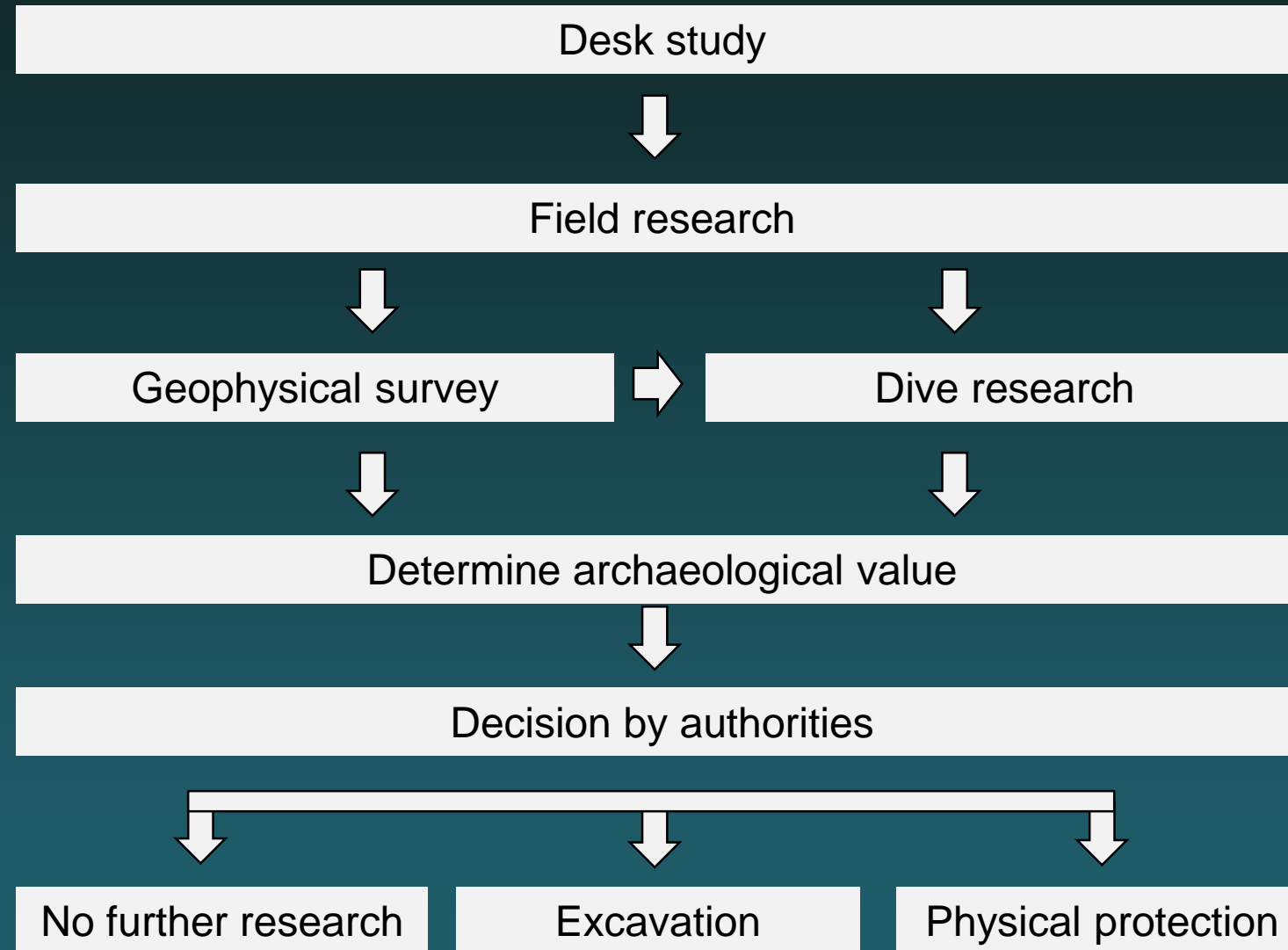
Archaeology and legislation

Dutch legislation - Heritage Act (Erfgoedwet) 2016:

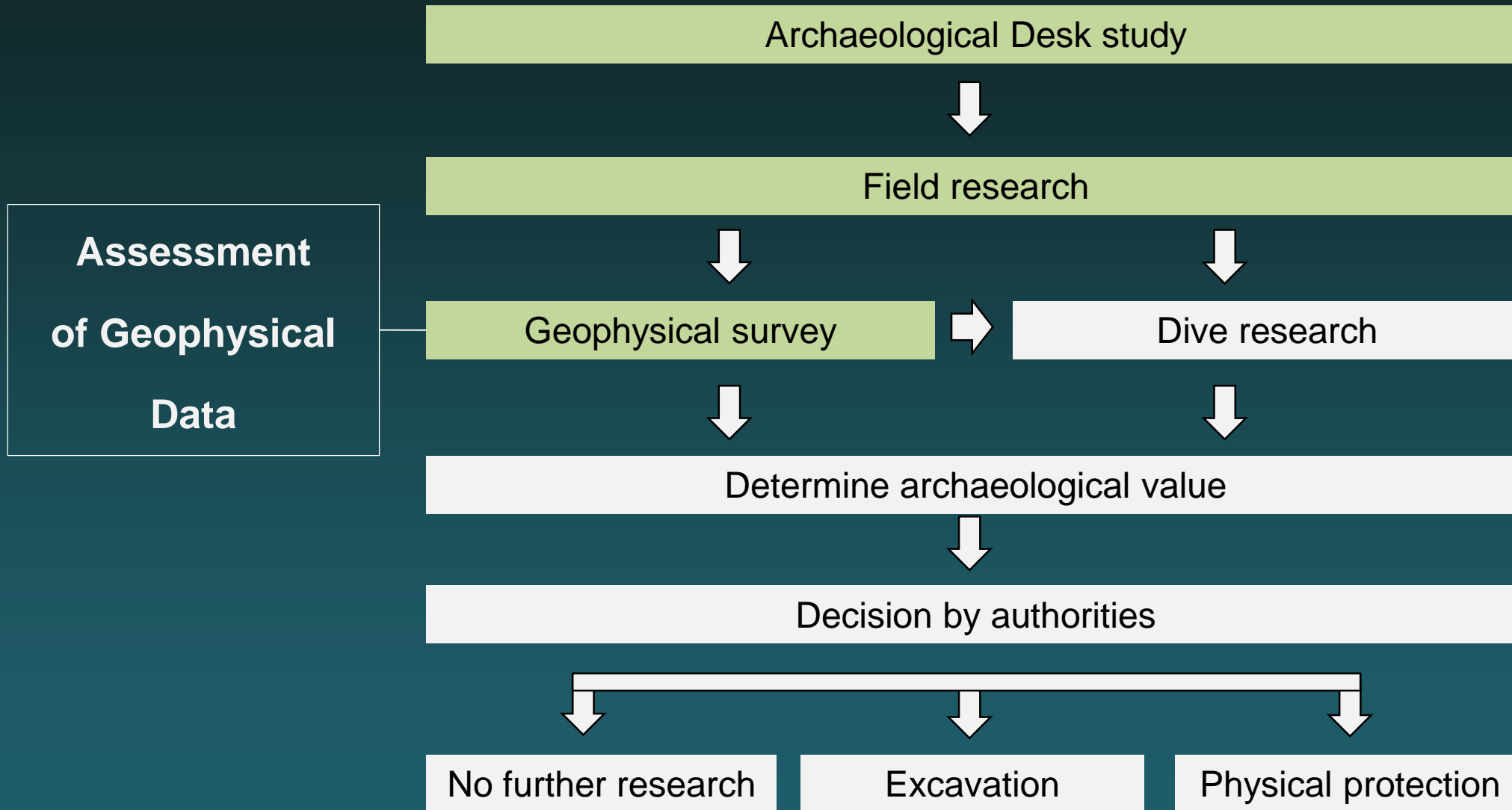
‘... strive to preserve archaeological remains *in situ* ...’

- If (possible) remains could be affected by activities:
avoid locations or obligation to conduct additional
research

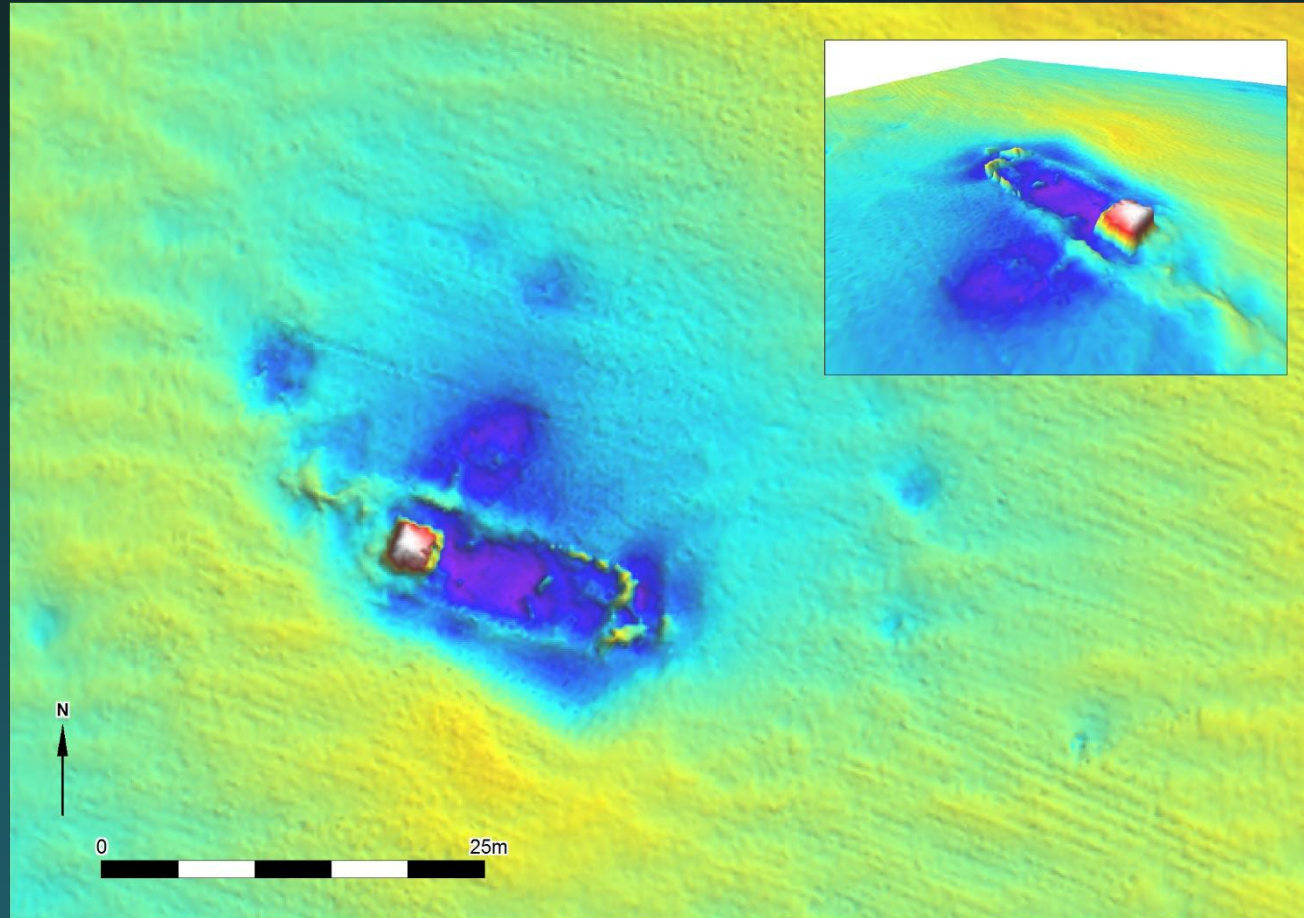
Archaeology and legislation



Archaeology and legislation



General example



Unidentified ship wreck → Assumption: archeological value

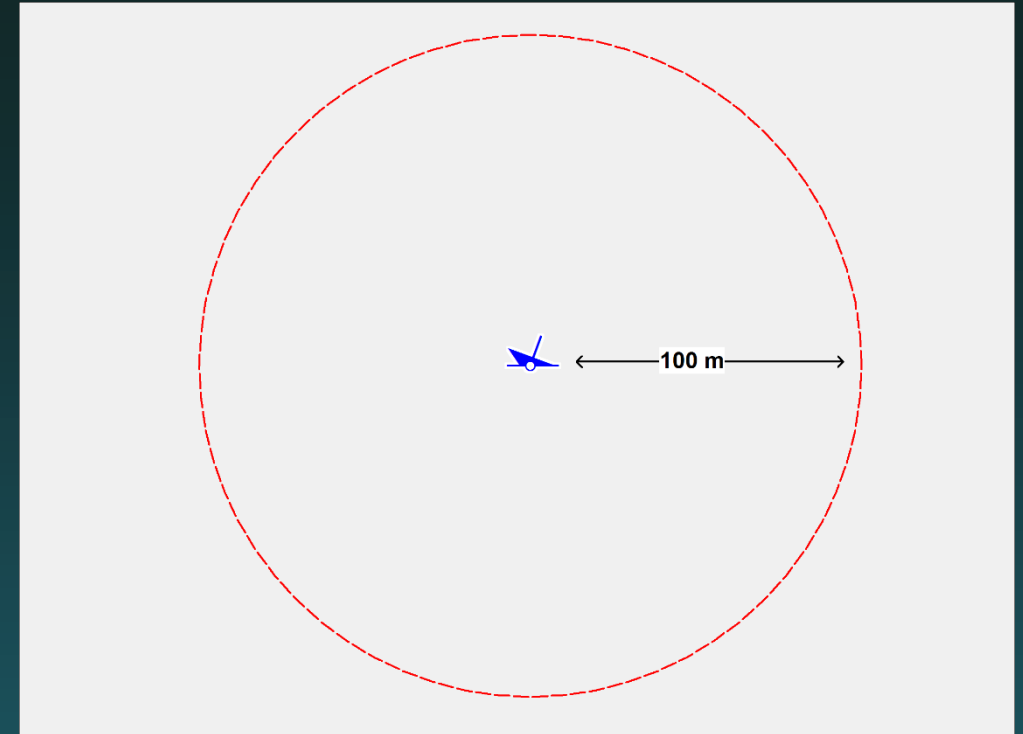
General example

Recommendation:

Avoid location (including a bufferzone of 100m)

or

Prove that site has no archaeological value
(additional research)



Legal base:

Policy Rules for Earth Removal in National Waters
(Beleidsregels ontgroningen in rijkswateren)

Heritage Act (Erfgoedwet)

Archaeological Desk Study 2018

Gather information on:

- current use of the area
- historical situation and possible disturbances
- known archaeological features and objects
- geological setting

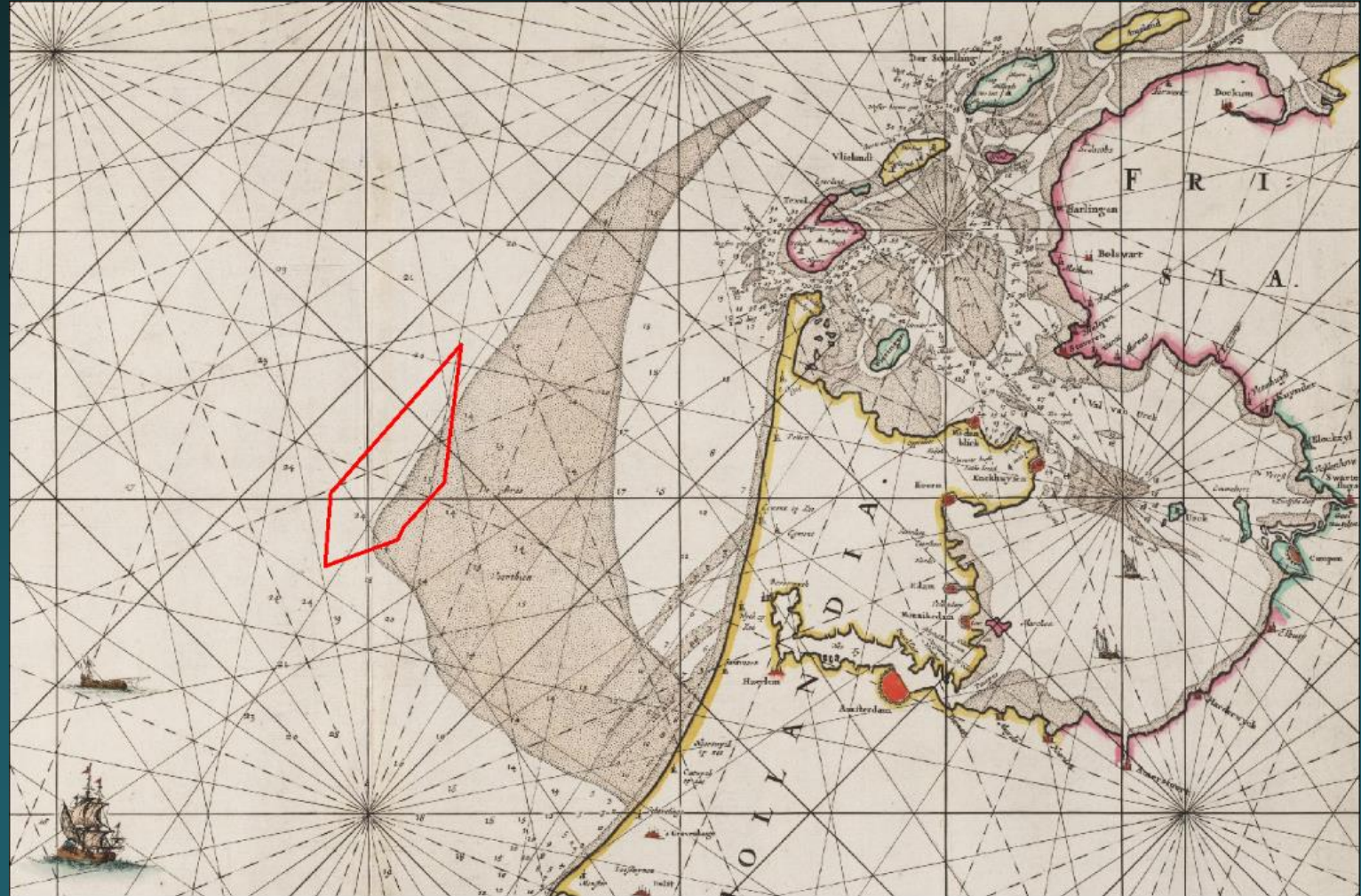
Result:

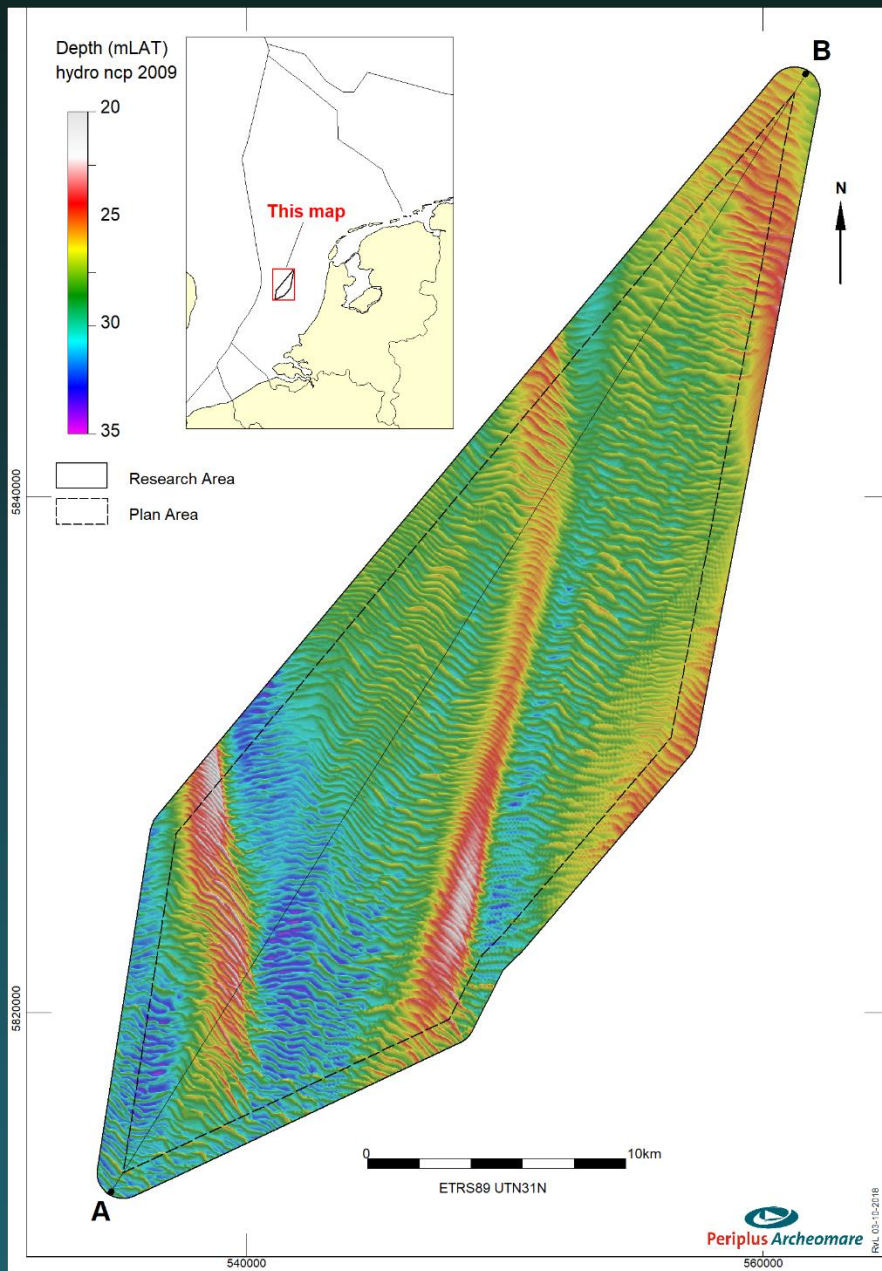
- specific archaeological expectation

Archaeological Desk study 2018

HKWWFZ 393 km²

Research Area 500 km²



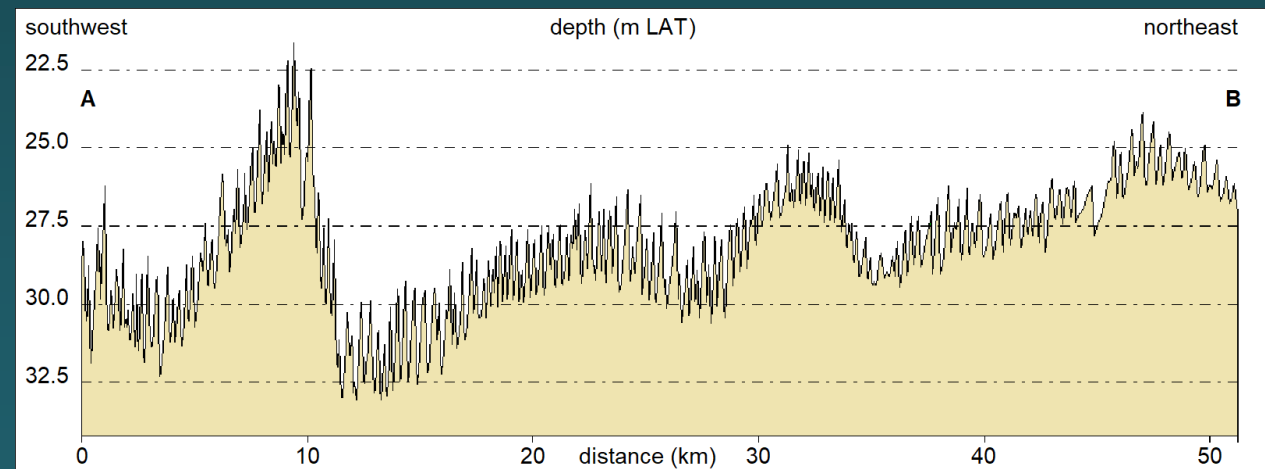


Water depth
Min 20 m LAT
Max 34 m LAT
Avg. 28 m LAT

Morphology
Ridges N-S
Height: 10m

Bathymetry

Sand dunes WNW – ESE
Wavelength 300m; height 1m
Migration 2-4m NE direction

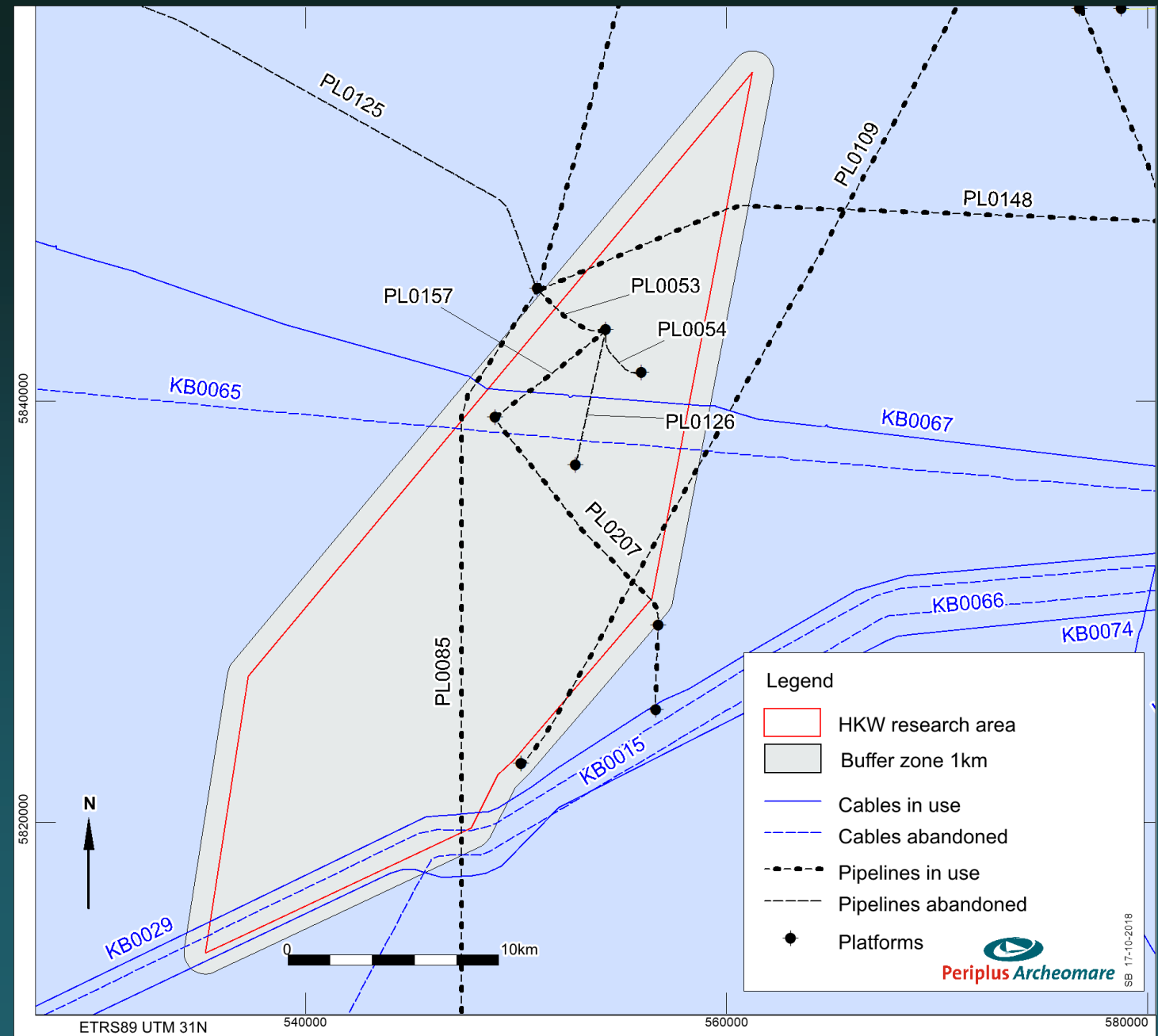


Previous Research

All conducted by
Periplus Archeomare



Known disturbances

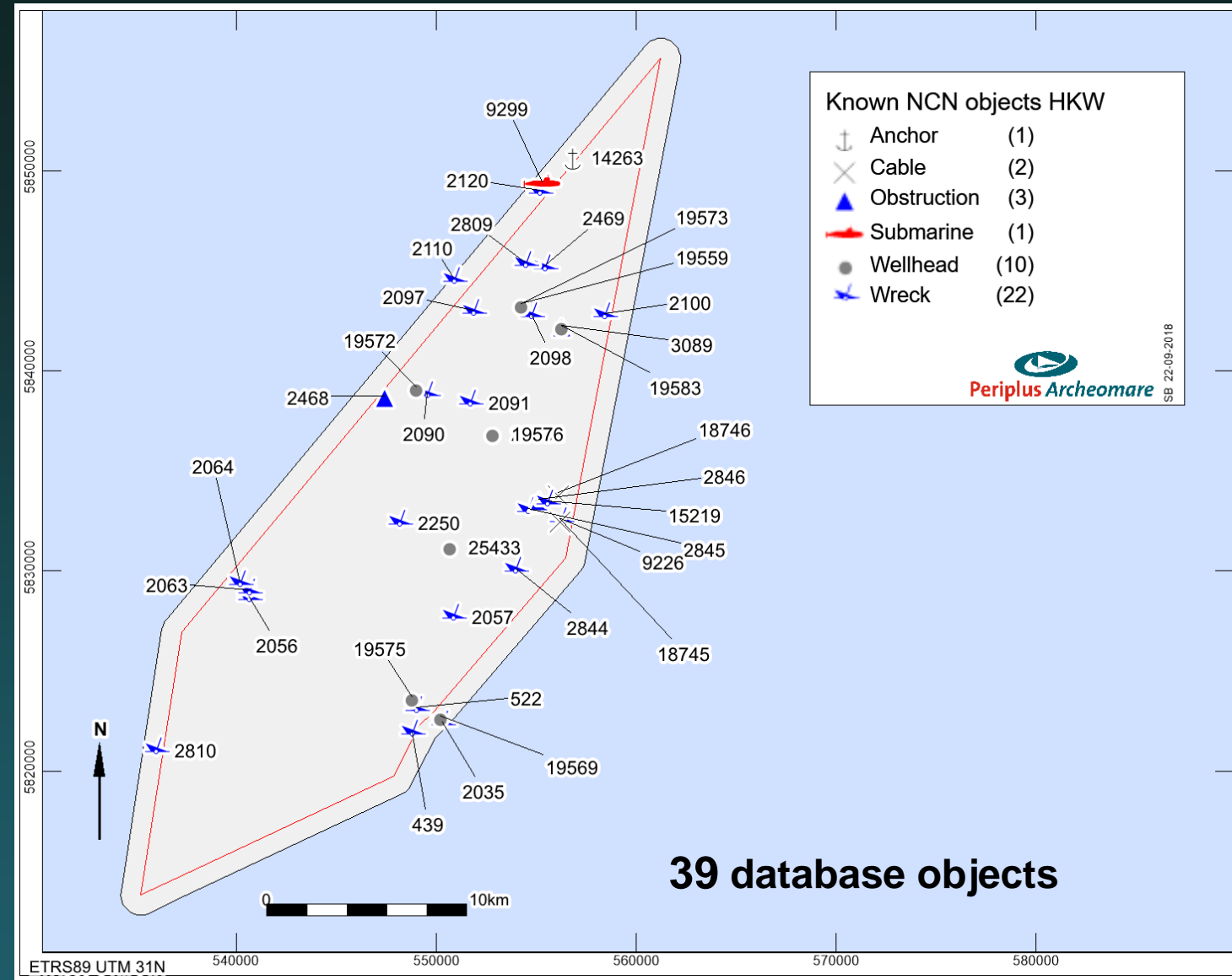
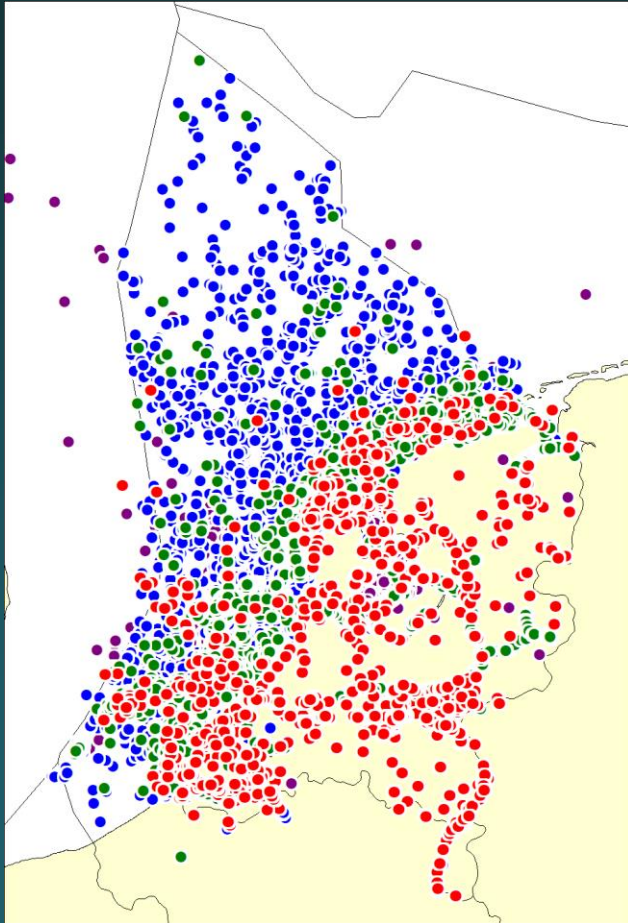


Known wrecks and objects

Sources:

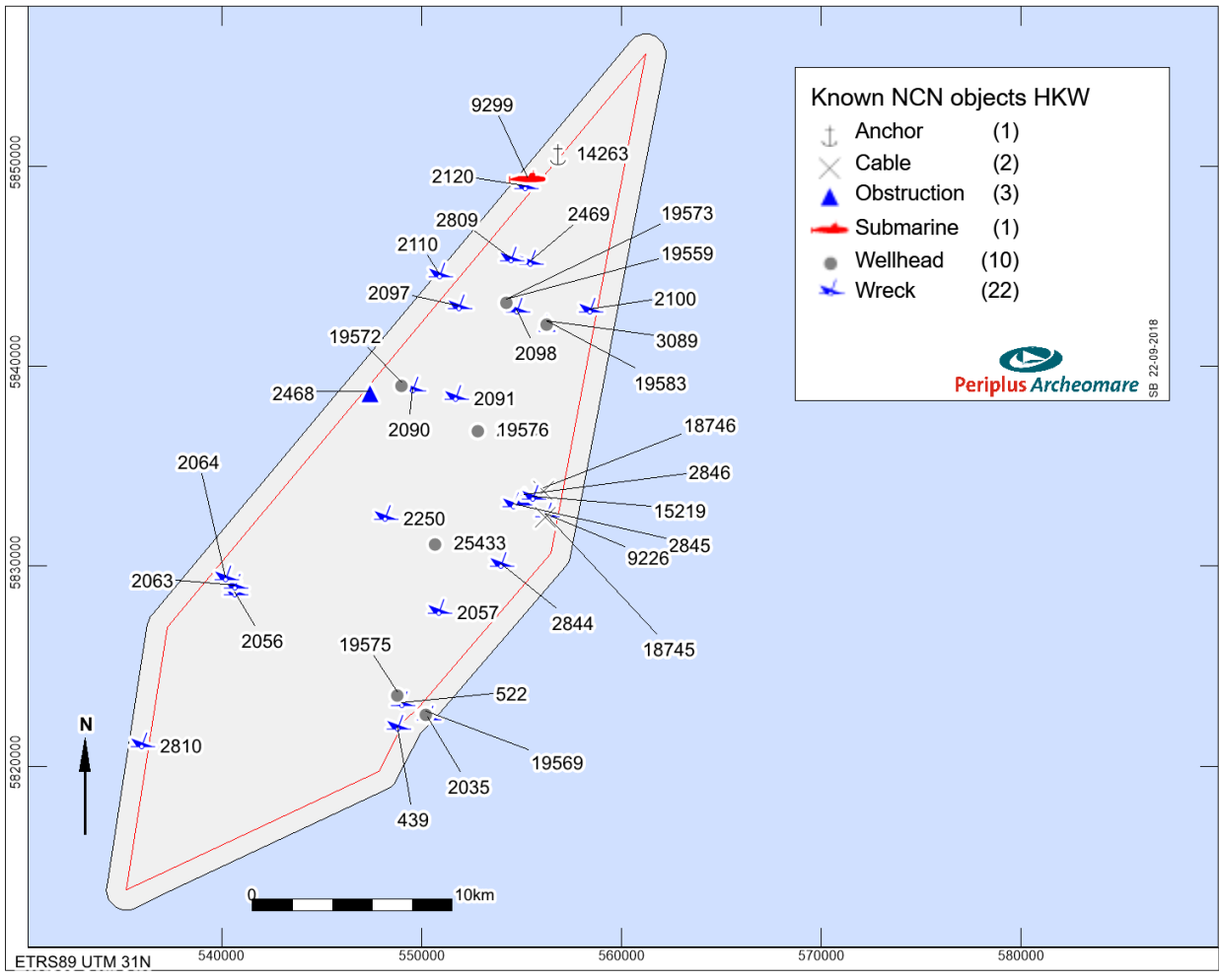
- Ministry of Cultural Heritage: ARCHIS
MARIAD
- Rijkswaterstaat: SonarReg92
- Dutch Hydrographic Office: NLHono
- Periplus Archeomare

Known objects



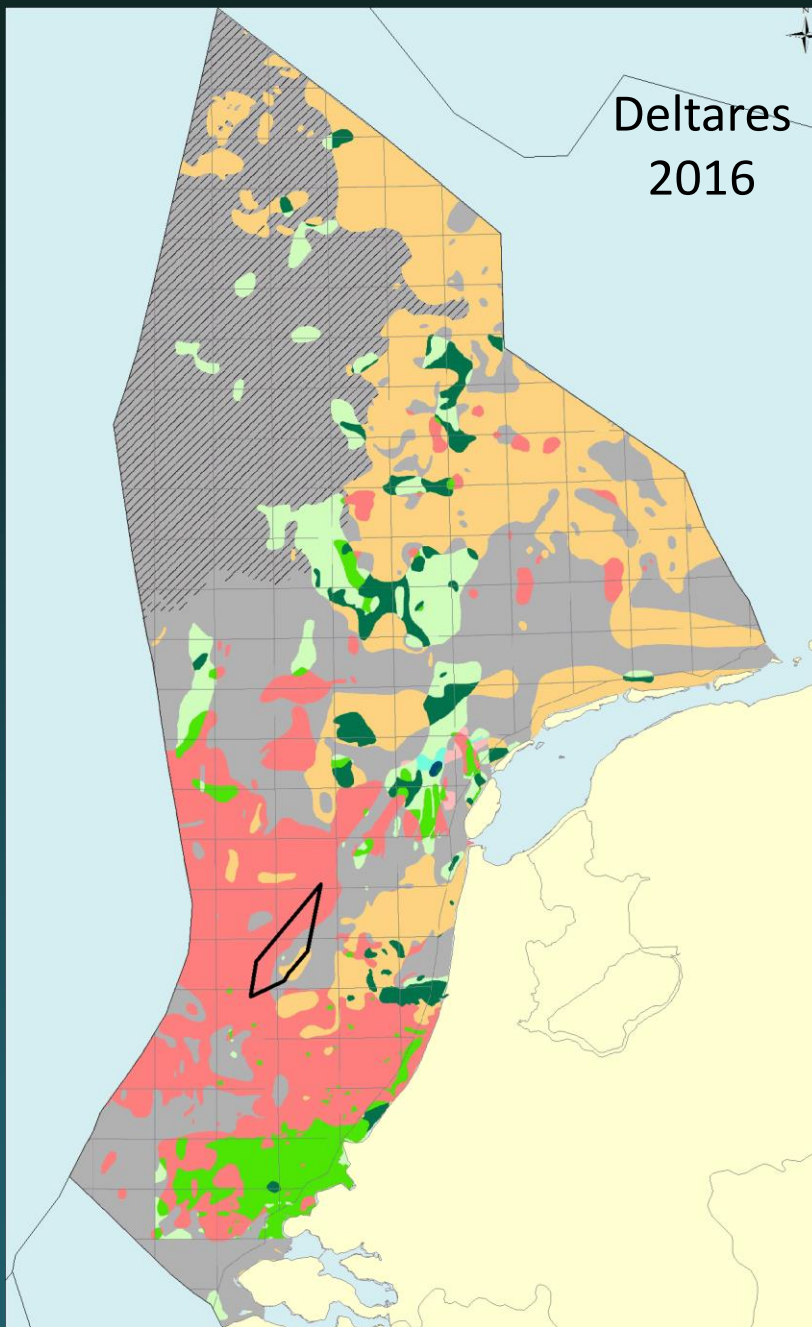
Desk study results

Database		Potential archaeological wreck sites	
Type	Number	No	Yes
Wrecks	23	4	19
Other	16	16	0
Total	39	20	19




Plane wrecks WOII : more than 200 planes still missing






Archaeological potential / drowned landscapes



Legend

 Research area

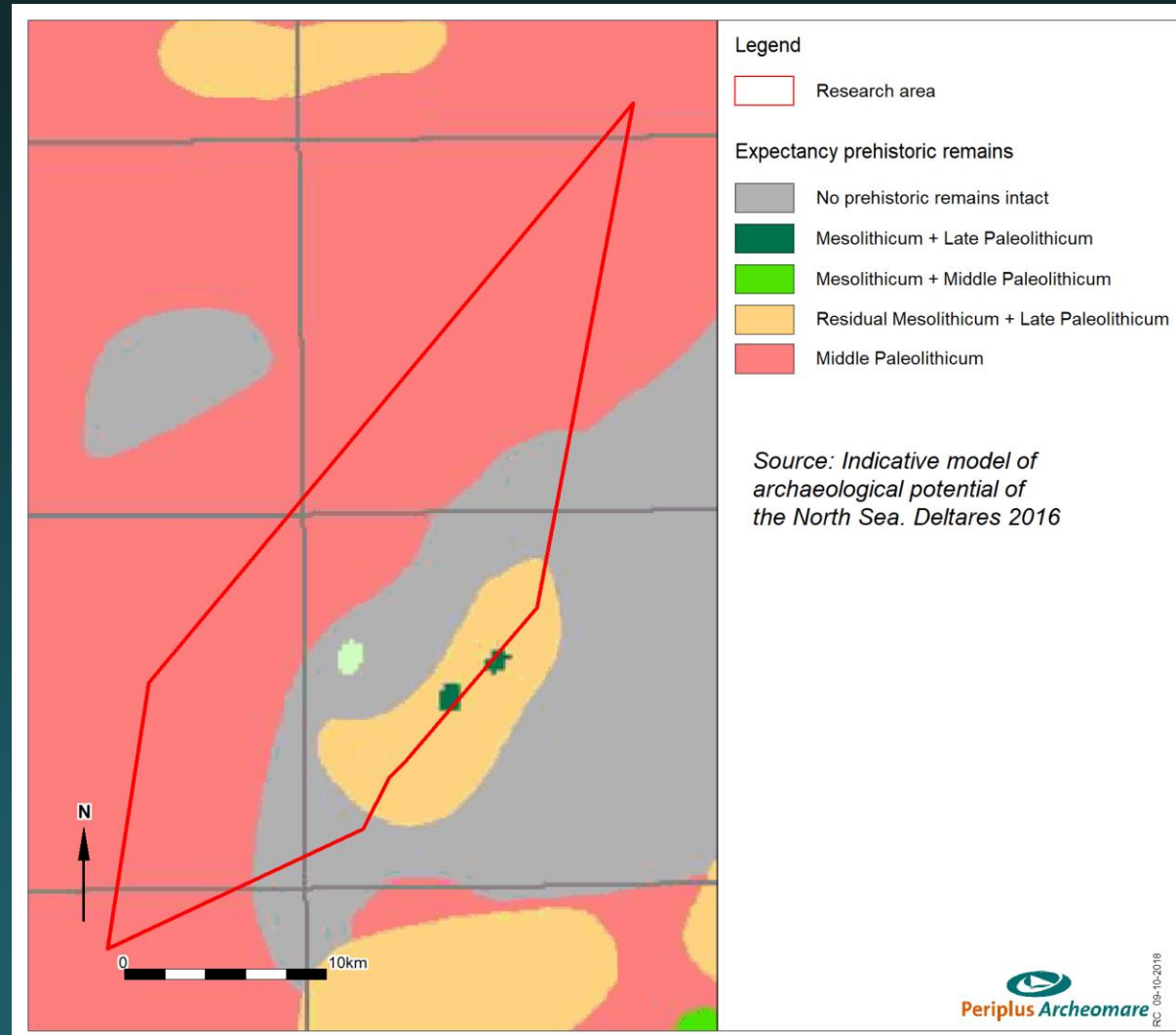
Expectancy prehistoric remains

-  No prehistoric remains intact
-  Mesolithicum + Late Paleolithicum
-  Mesolithicum + Middle Paleolithicum
-  Residual Mesolithicum + Late Paleolithicum
-  Middle Paleolithicum

Source: Indicative model of archaeological potential of the North Sea. Deltares 2016



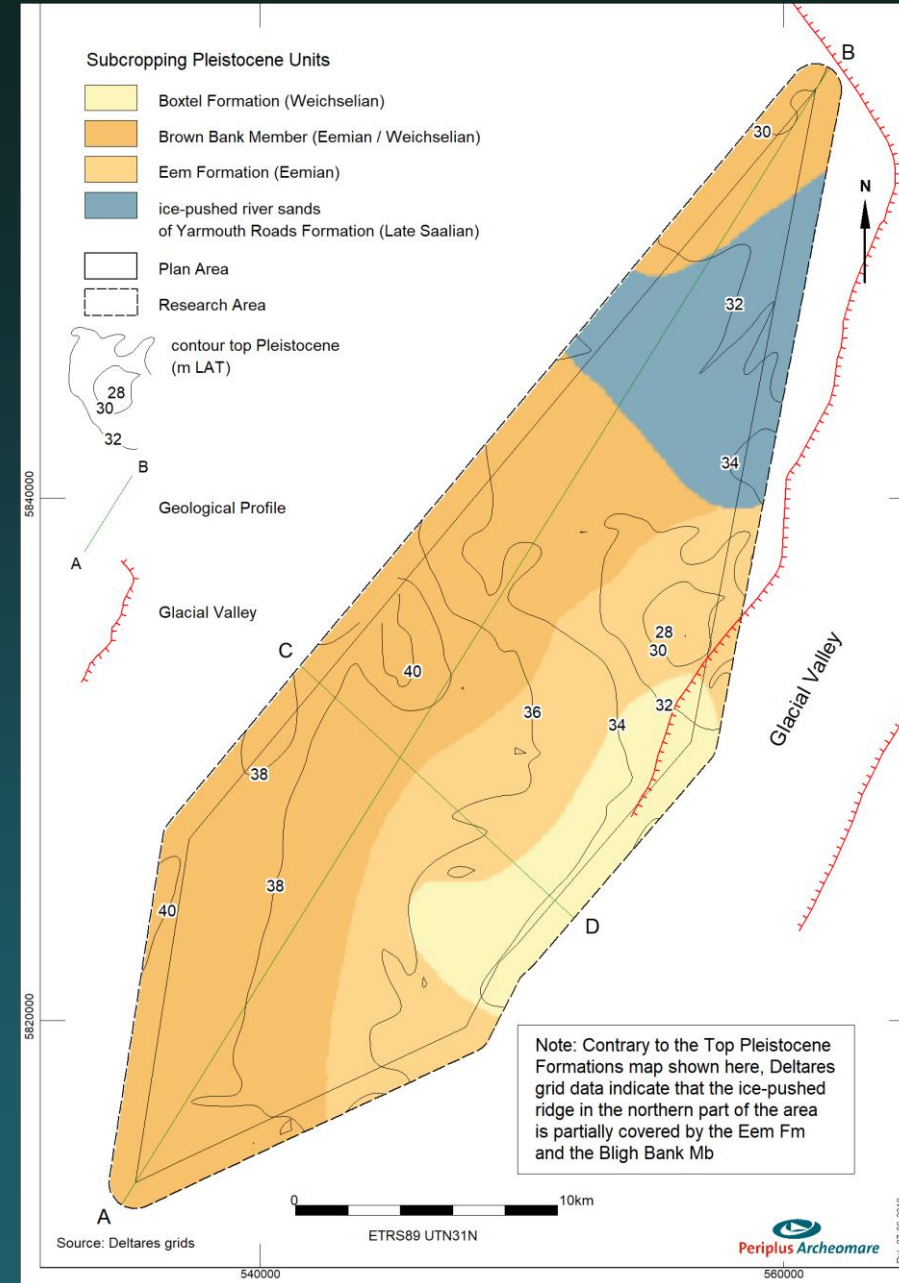
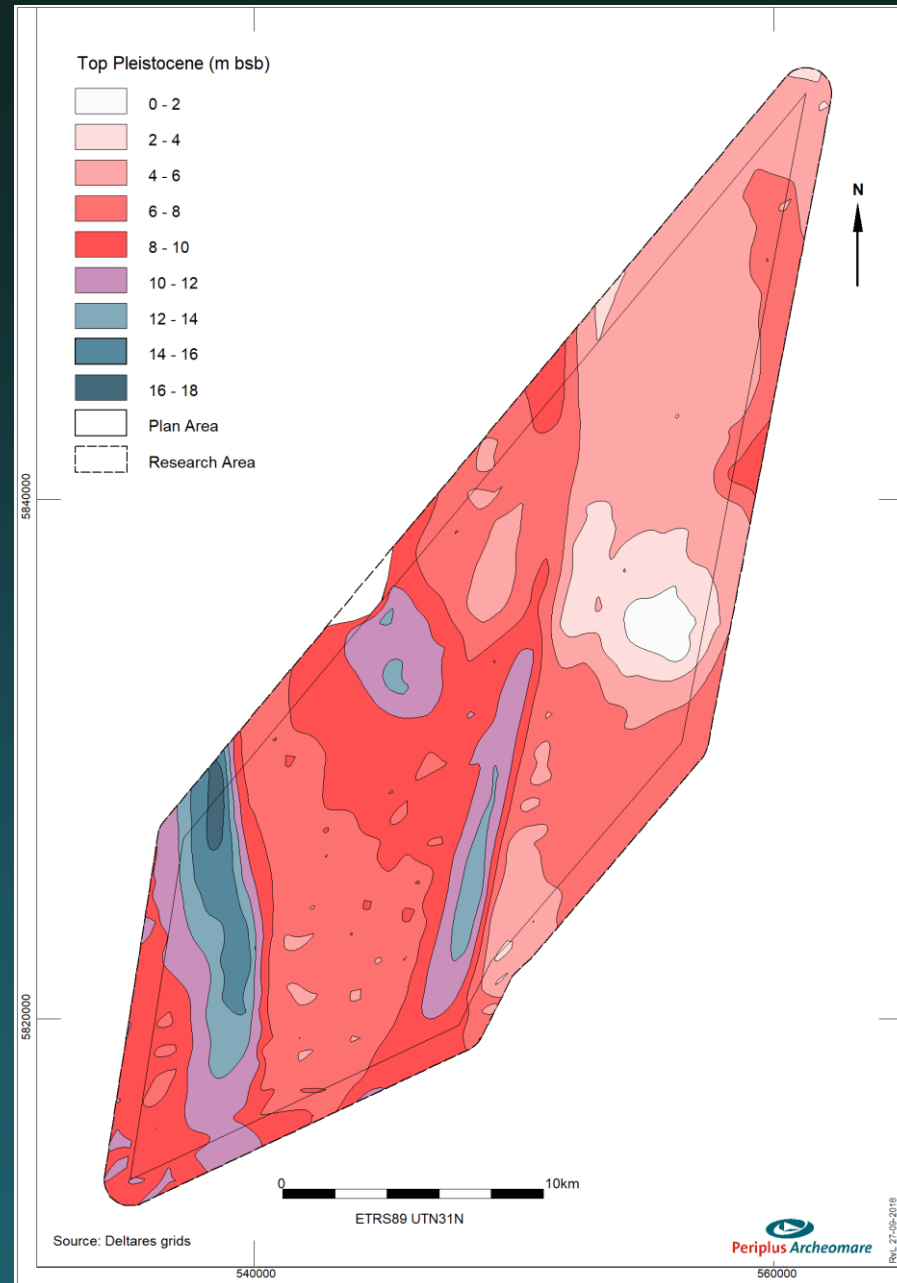
Archaeological potential



Geological units

Archaeology -
Landscape –
Geology

PLEISTOCENE UNITS



Archaeological levels

Formation	Member / Bed	Lithology	Age	Arch. Expectancy*	Period
Southern Bight	Bligh bank	sand	Holocene	I, IV	Historical period
Naaldwijk	Wormer	clay and sand	Early Holocene	I	Mesolithic
	Velsen	humic clay		II	
Nieuwkoop	Basal Peat	peat		II	
Boxtel	Singraven	sand, loam, clay and peat	Weichselian and Early Holocene	II and III	Late Paleolithic and Mesolithic
	Wierden	fine sand		III	
Woudenberg		peat	Eemian and Early Weichselian	II	Middle Paleolithic
Eem	Brown Bank	humic clay and silt	Eemian and Early Weichselian	II and III	Middle Paleolithic
		sand and clay	Eemian	IV	
Yarmouth Roads (ice-pushed)		sand and clay	Pre-Saalian and Saalian (ice-push event)	II, III and IV	Early Paleolithic to Mesolithic
Drente	Uitdam	sand, silt and clay	Saalian	II and III	Middle Paleolithic
	Schaarsbergen	sand		II	
	Gieten	gravelly clay, loam, and sand with cobbles and boulders		III	

Conclusions desk study

Facts:

- 16 known wreck sites of possible archeological interest
- Late Pleistocene landscape covered by Holocene deposits
- Integrity of Pleistocene landscape and possible prehistoric remains is unknown

Expected remains:

- Undiscovered ship wrecks and WWII aircrafts
- *In situ* buried prehistoric remains

Recommendations: geophysical survey

In order to map wrecks and confirm known locations:

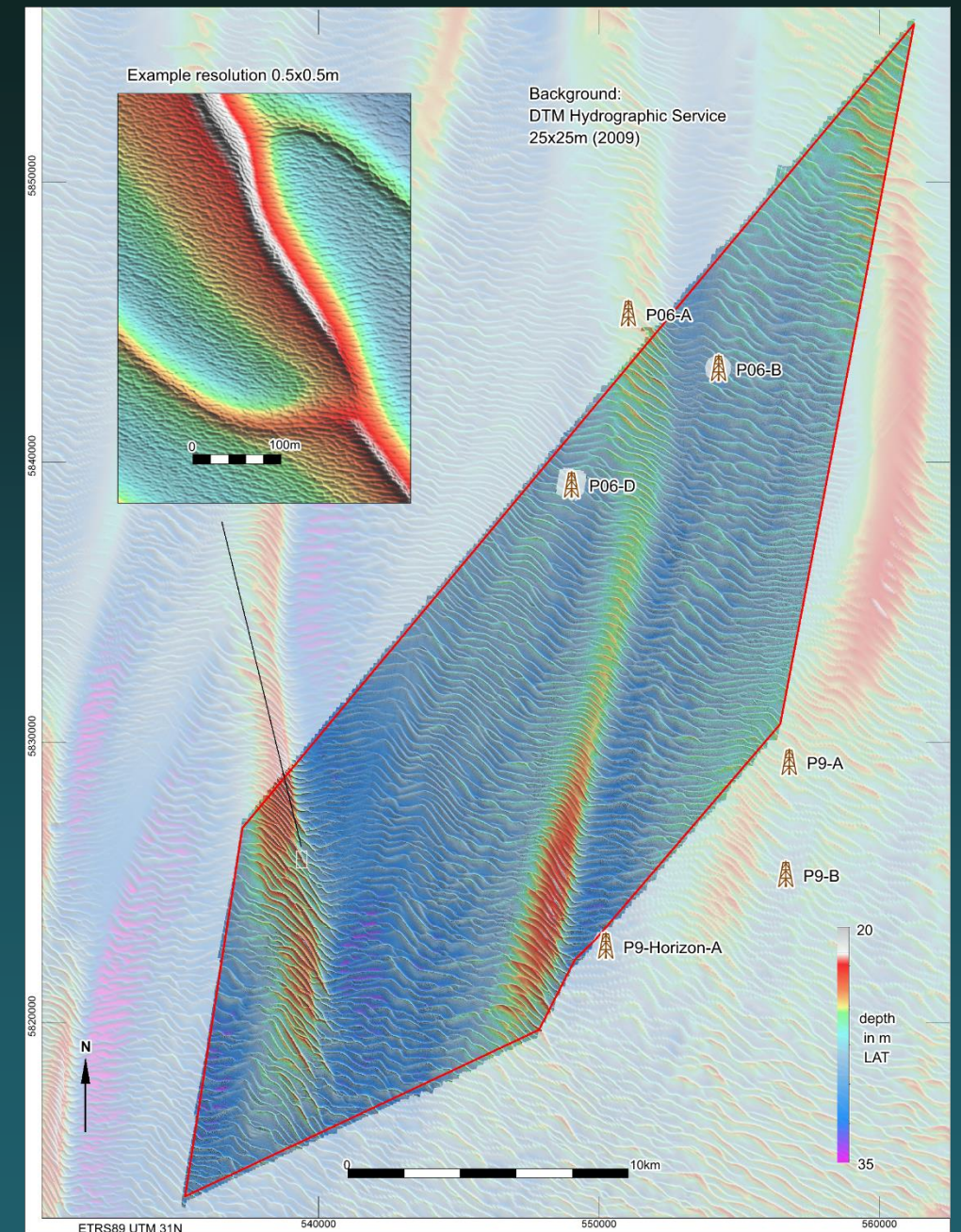
- **Side scan sonar and magnetometer survey**

In order to map the prehistoric landscape:

- **Subbottom profiling**

Geophysical survey Fugro 2018

- side scan sonar
- single beam echo sounder
- magnetometer
- multibeam echo sounder
- sub-bottom profiler; pinger
- ultra high resolution seismic



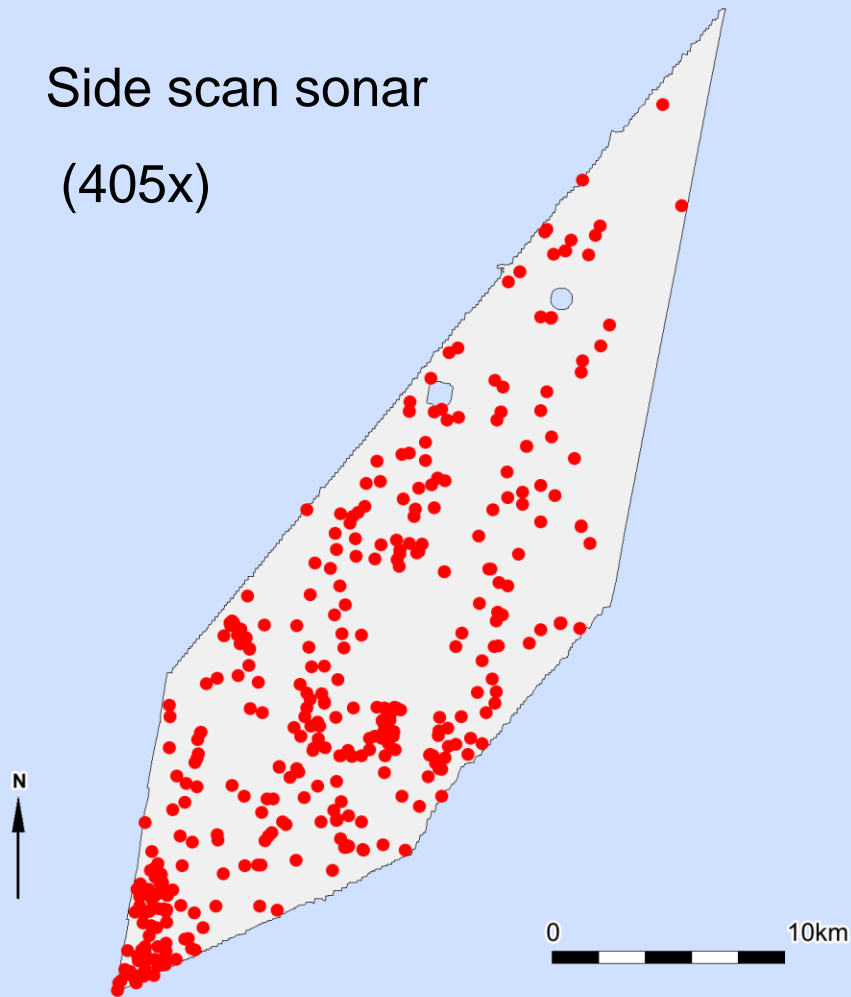
Assessment geophysical survey data

The goals set for this assessment were:

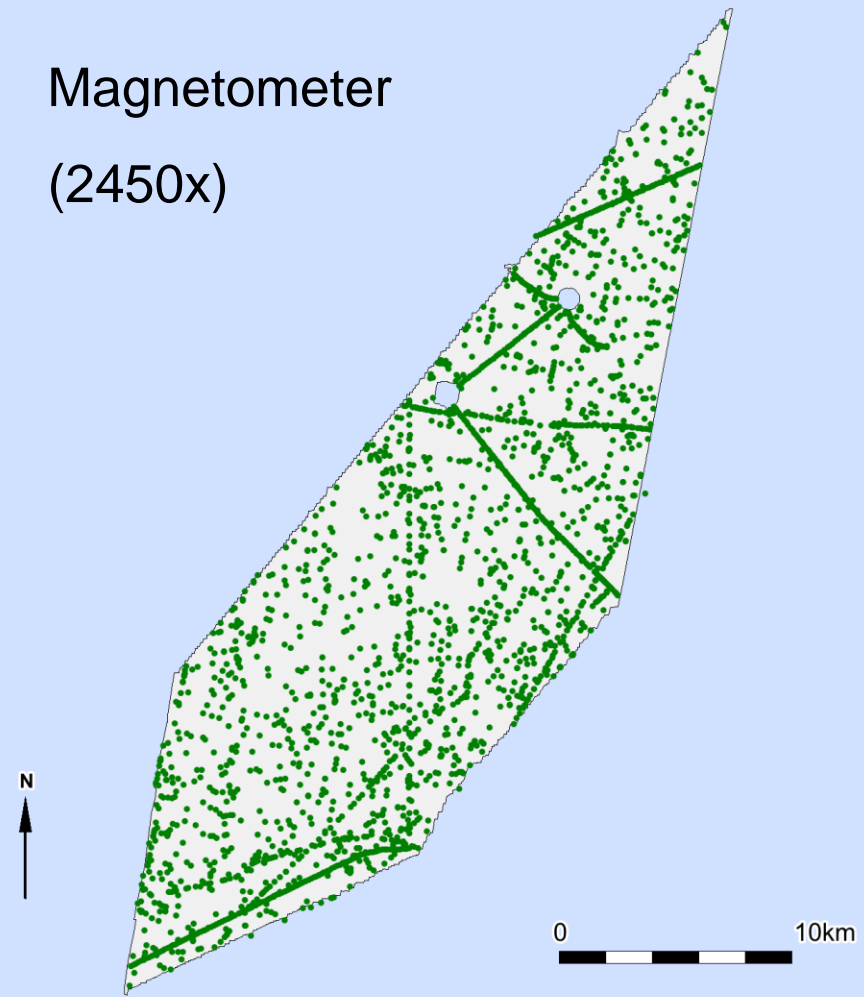
- Validate the locations of known wrecks and objects
- Assess the possible value of newly found contacts
- Assess the prehistoric landscape based on the seismic data

Results sonar & magnetometer

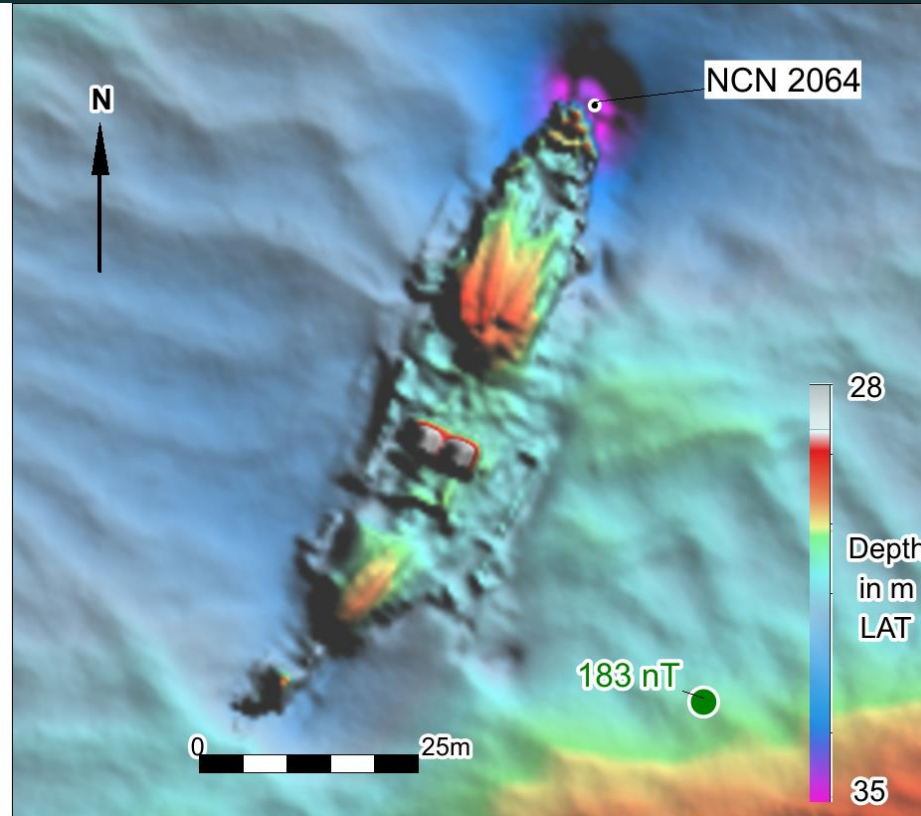
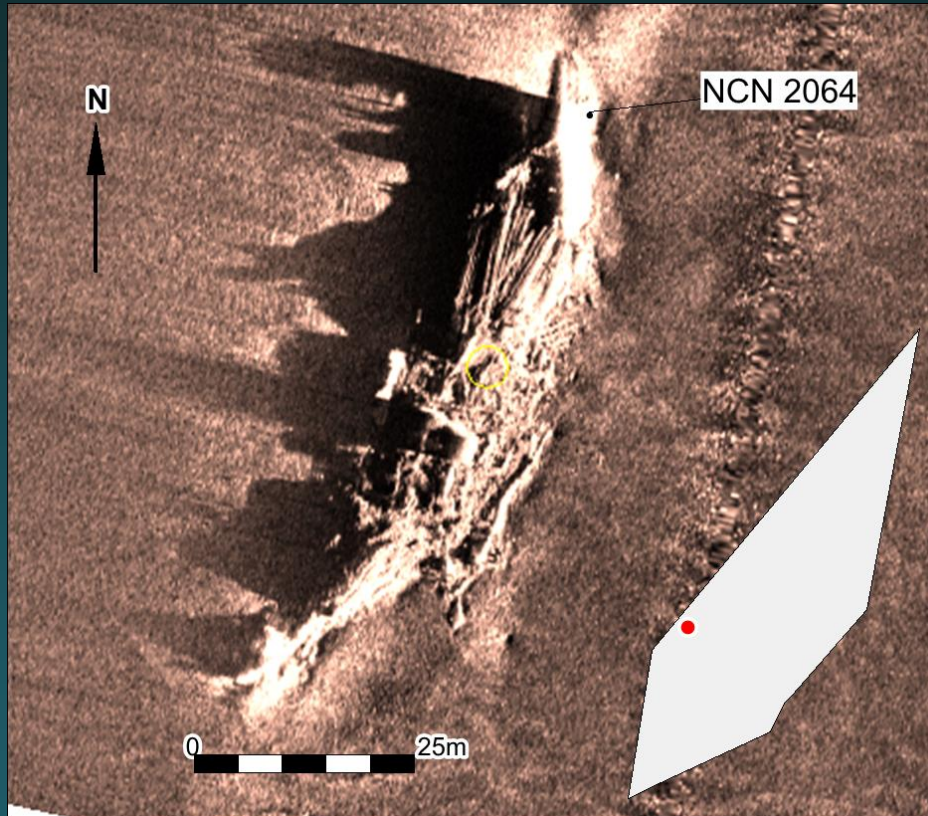
Side scan sonar
(405x)



Magnetometer
(2450x)

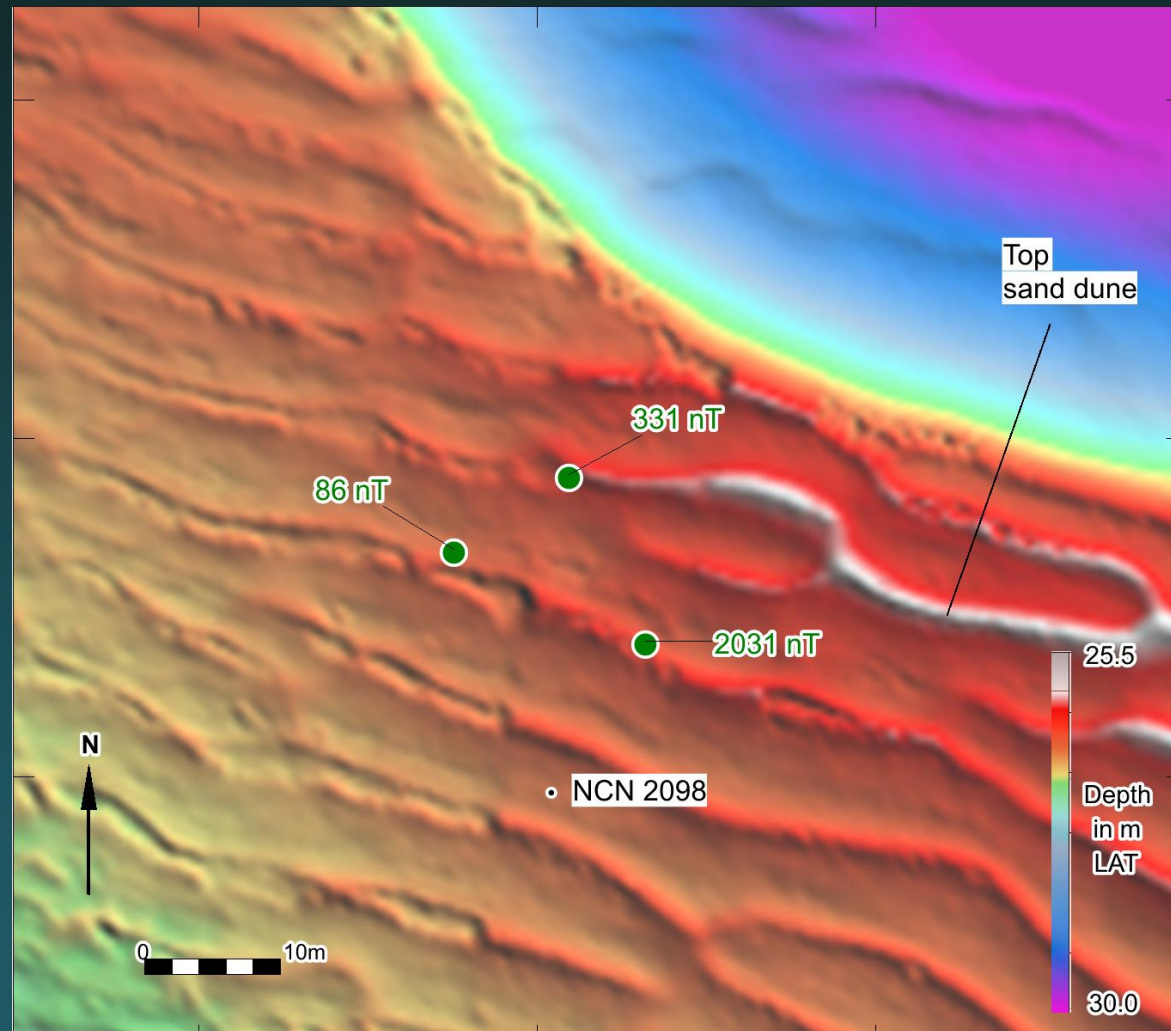


Verification known objects



NCN 2064
represent the
wreck of the SS
Paris, sunk in 1939

Verification known objects



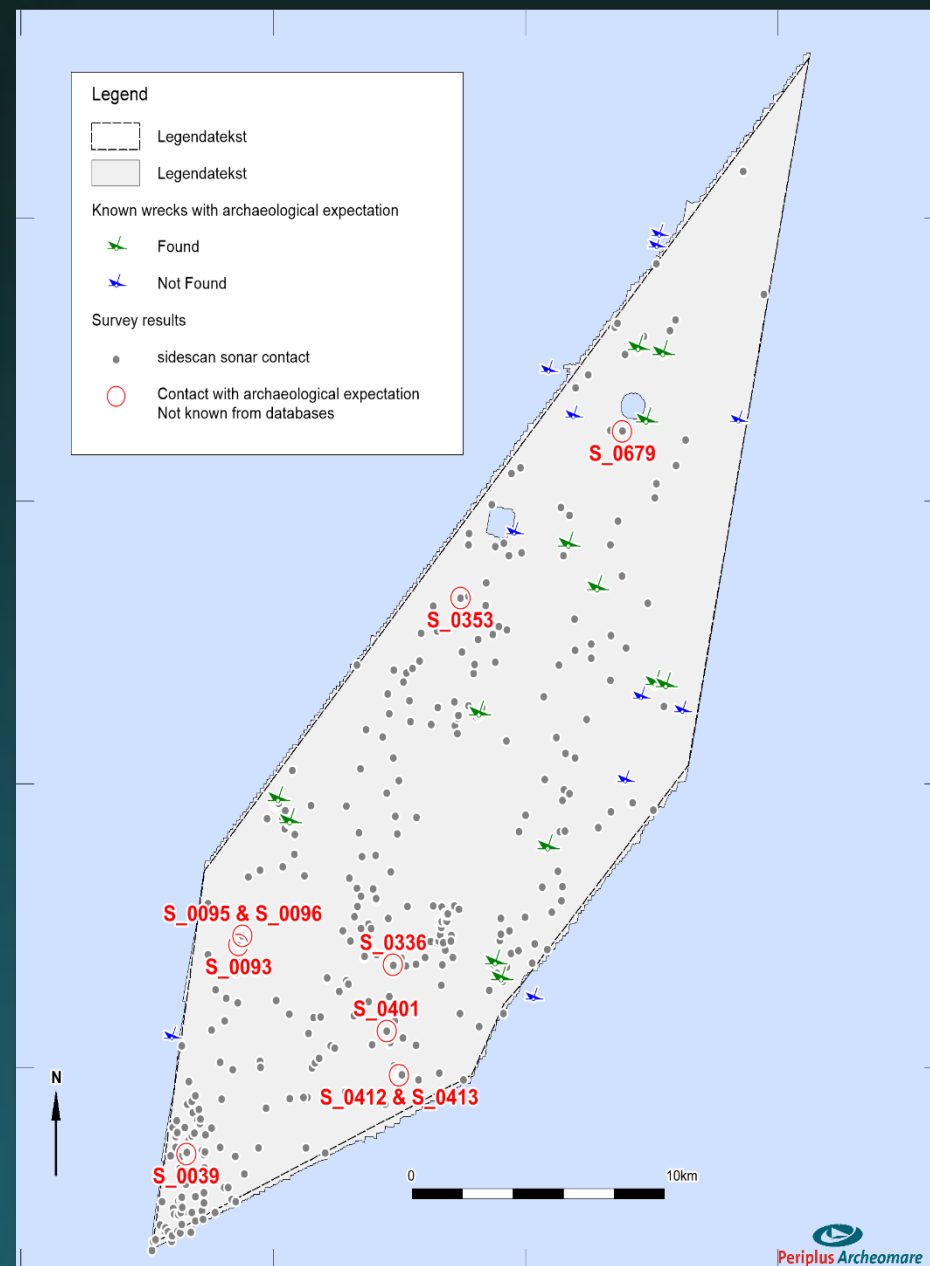
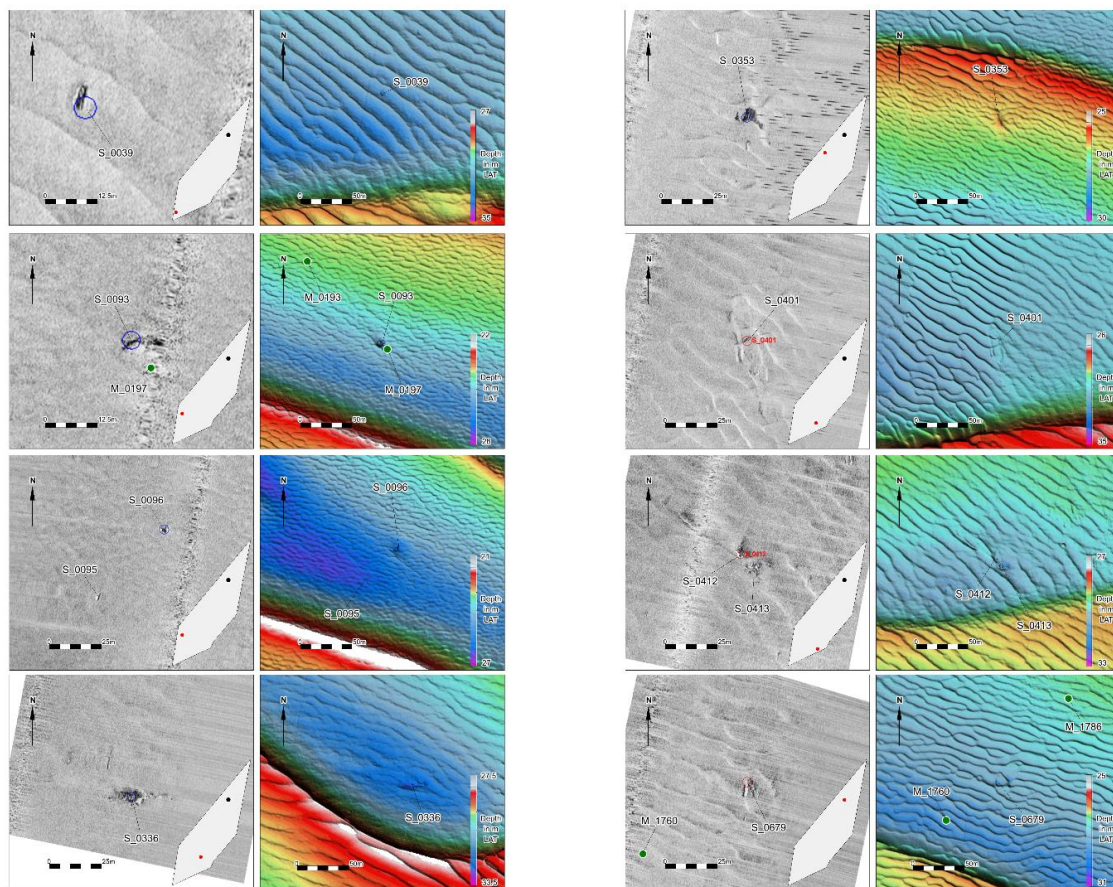
NCN 2098

‘Boezemwrak’

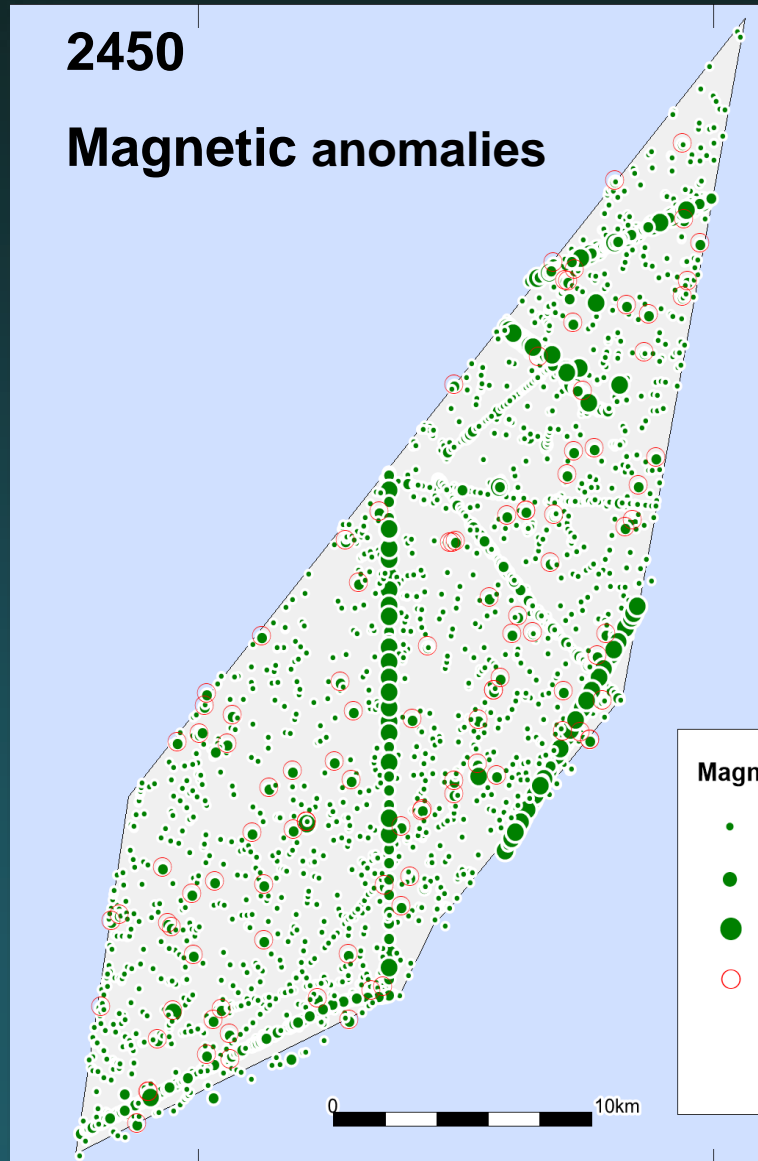
Buried in sea bed

New objects

Archeological expectation assigned to:
10 objects at 8 locations



Magnetic Anomalies

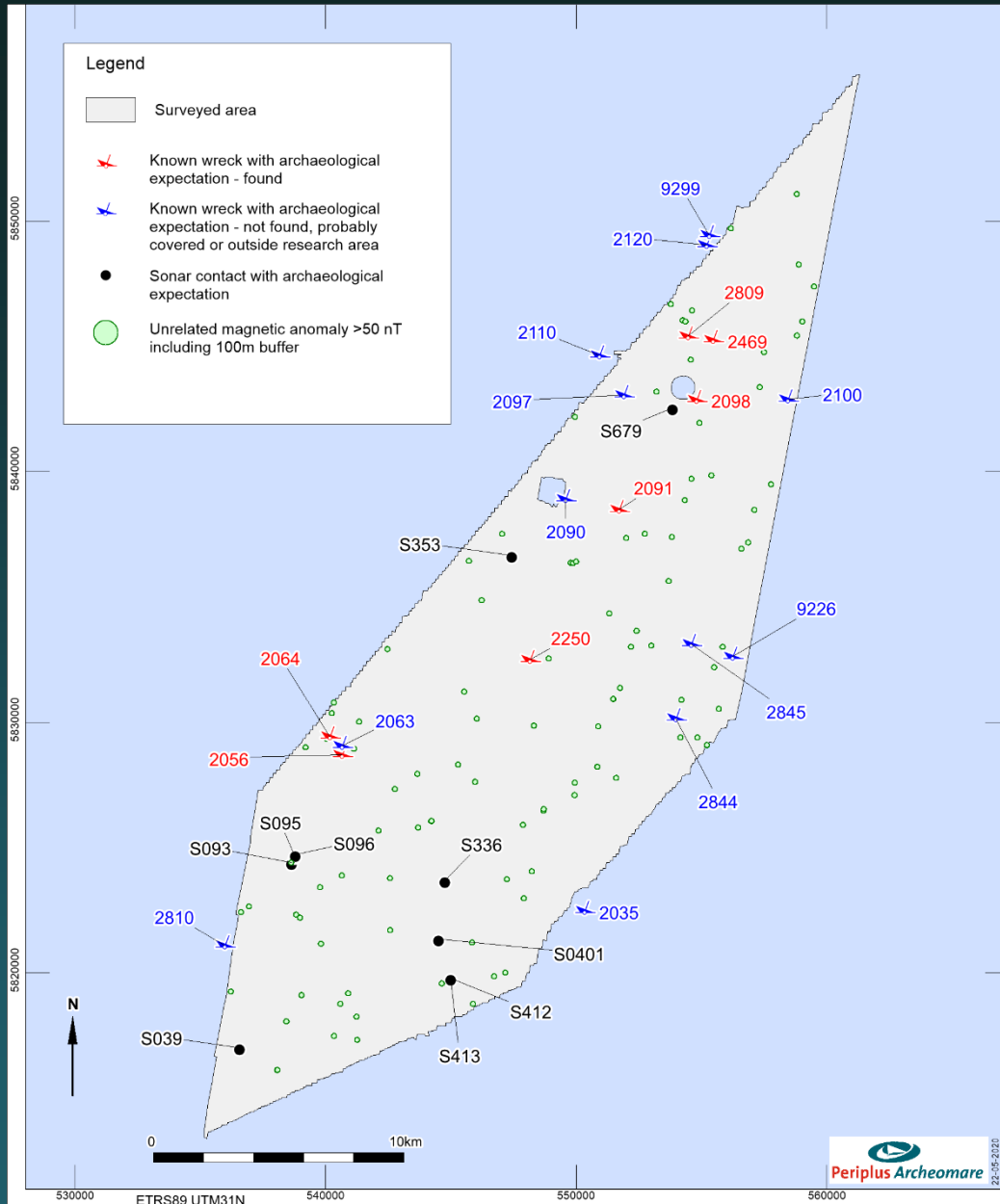


Magnetometer

- 2450 anomalies
- 674: pipe lines or cables
- 107 contacten > 50 nT not within 50m sonar contact and not related to cable or pipe line

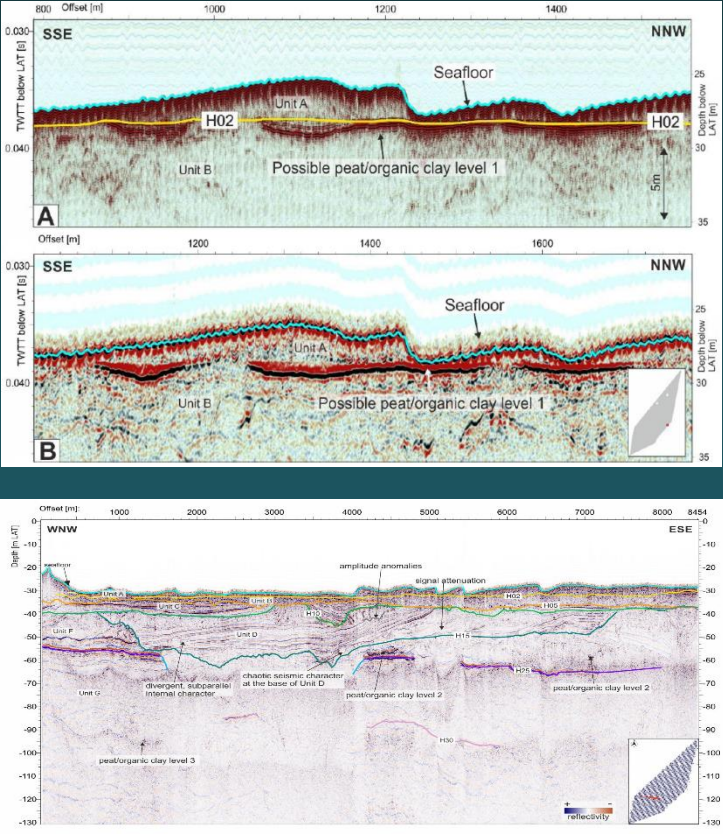
Advice: Avoid locations 107 anomalies incl. bufferzone 100m

Summary potential archaeological object locations




Location	Number
Arch. Sonar contacts	17
of which Known arch. wrecks	7
Not found objects	12
Magnetic anomalies (> 50 nT)	107

Prehistoric landscape




Glacial Morphology and related sedimentation


Glacial valley infill (Saalian - Eemian)


 glaciofluvial / glaciomarine sand | Unit E


Eem Sea (Eemian)

 layered marine sediments | Unit D


Zones of glacial deformation (Saalian)*


 extensive deformation | Unit F

 slight to extensive deformation

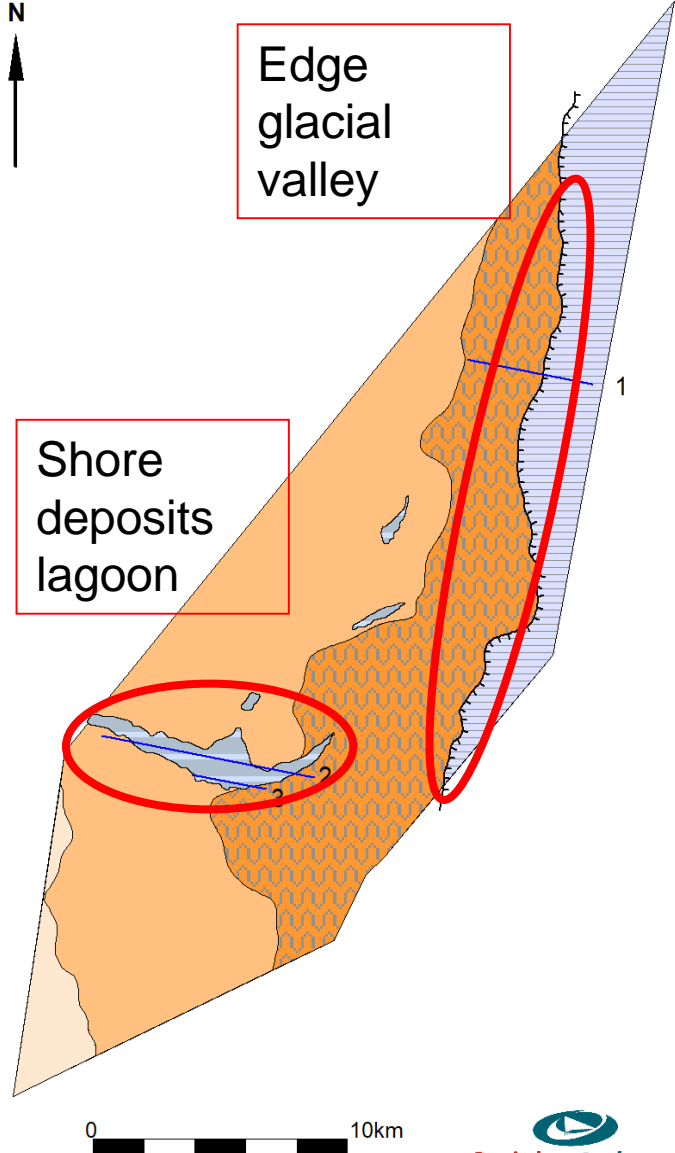
 inferred absence of direct glacial deformation

* ice-pushed river deposits of the Yarmouth Roads Formation

 border Unit E / F

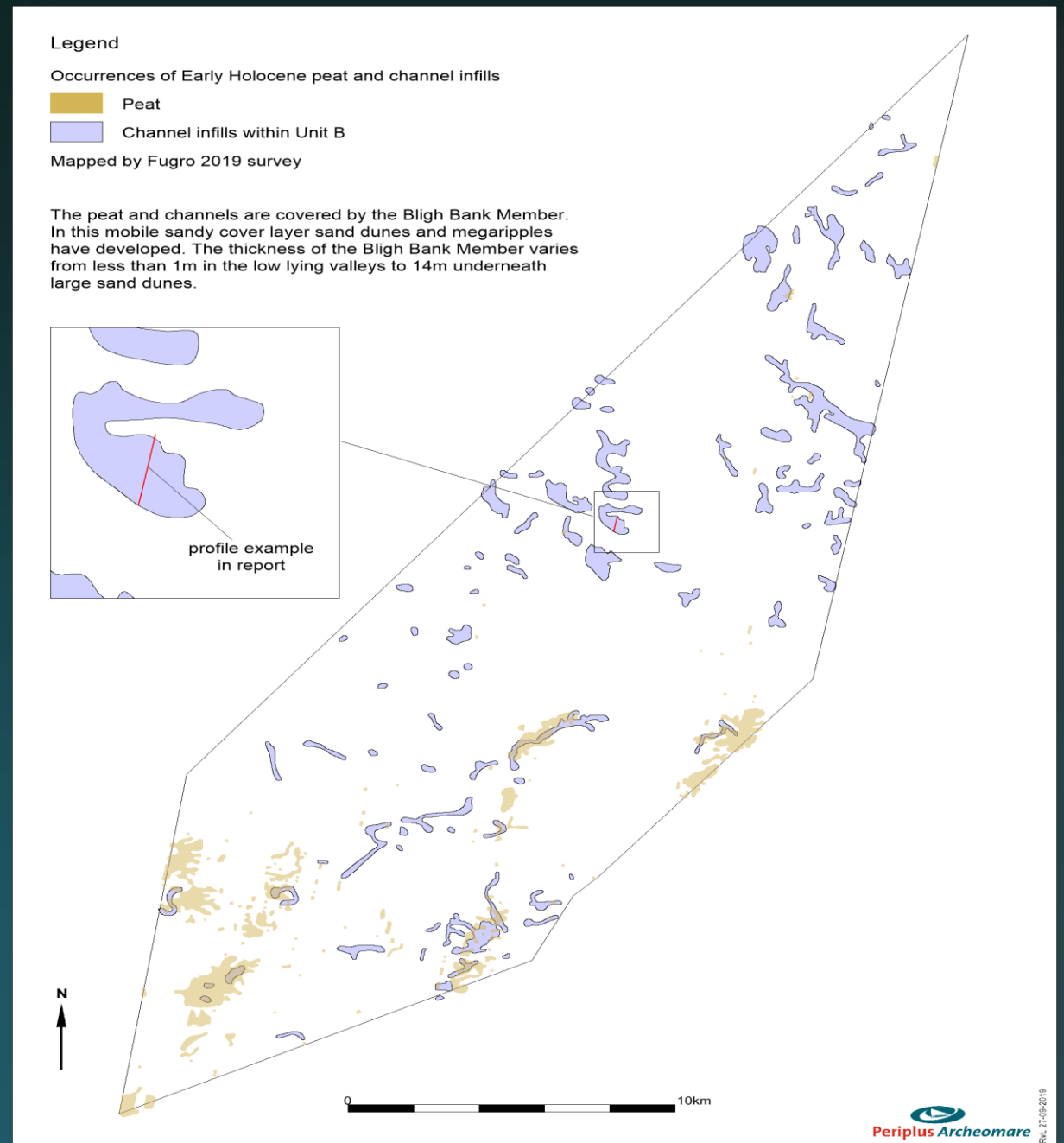
 profile

source: Fugro (2018): processed and interpreted seismic data



Prehistoric landscape


Early Holocene peat
and filled channels




Prehistoric landscape – geotechnical samples

Advice


Glacial valley infill (Saalian - Eemian)


 glaciofluvial / glaciomarine sand | Unit E


Eem Sea (Eemian)

 layered marine sediments | Unit D


Zones of glacial deformation (Saalian)*


 extensive deformation |

 slight to extensive deformation | Unit F

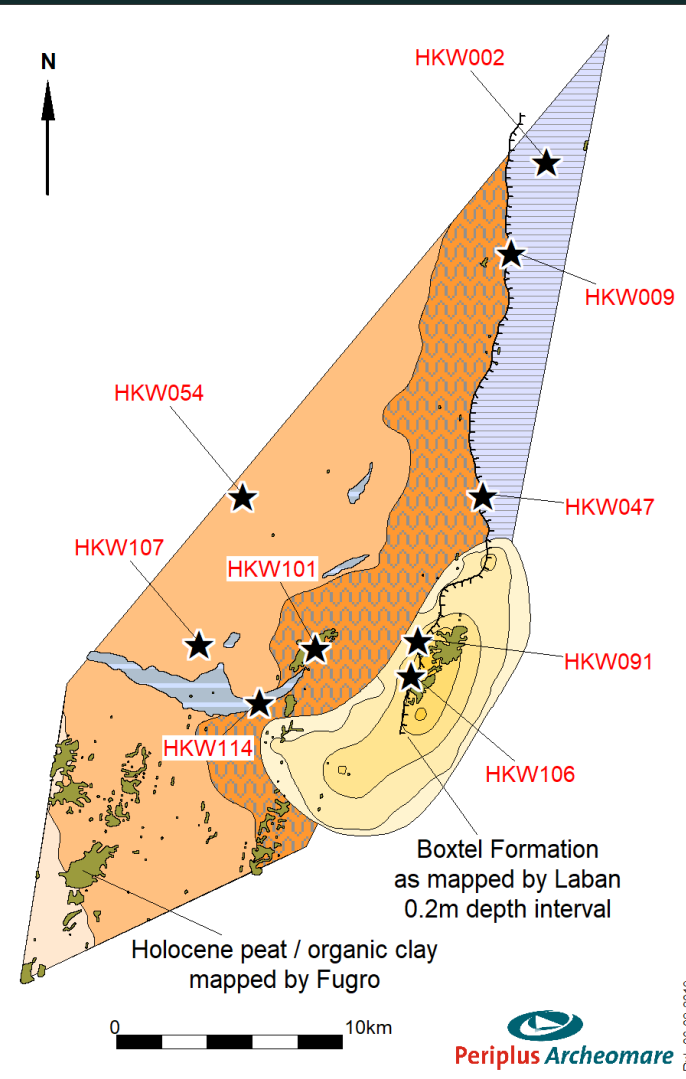
 inferred absence of direct glacial deformation

* ice-pushed river deposits of the Yarmouth Roads Formation

 border Unit E / F

 borehole location

source: Fugro (2018): processed and interpreted seismic data



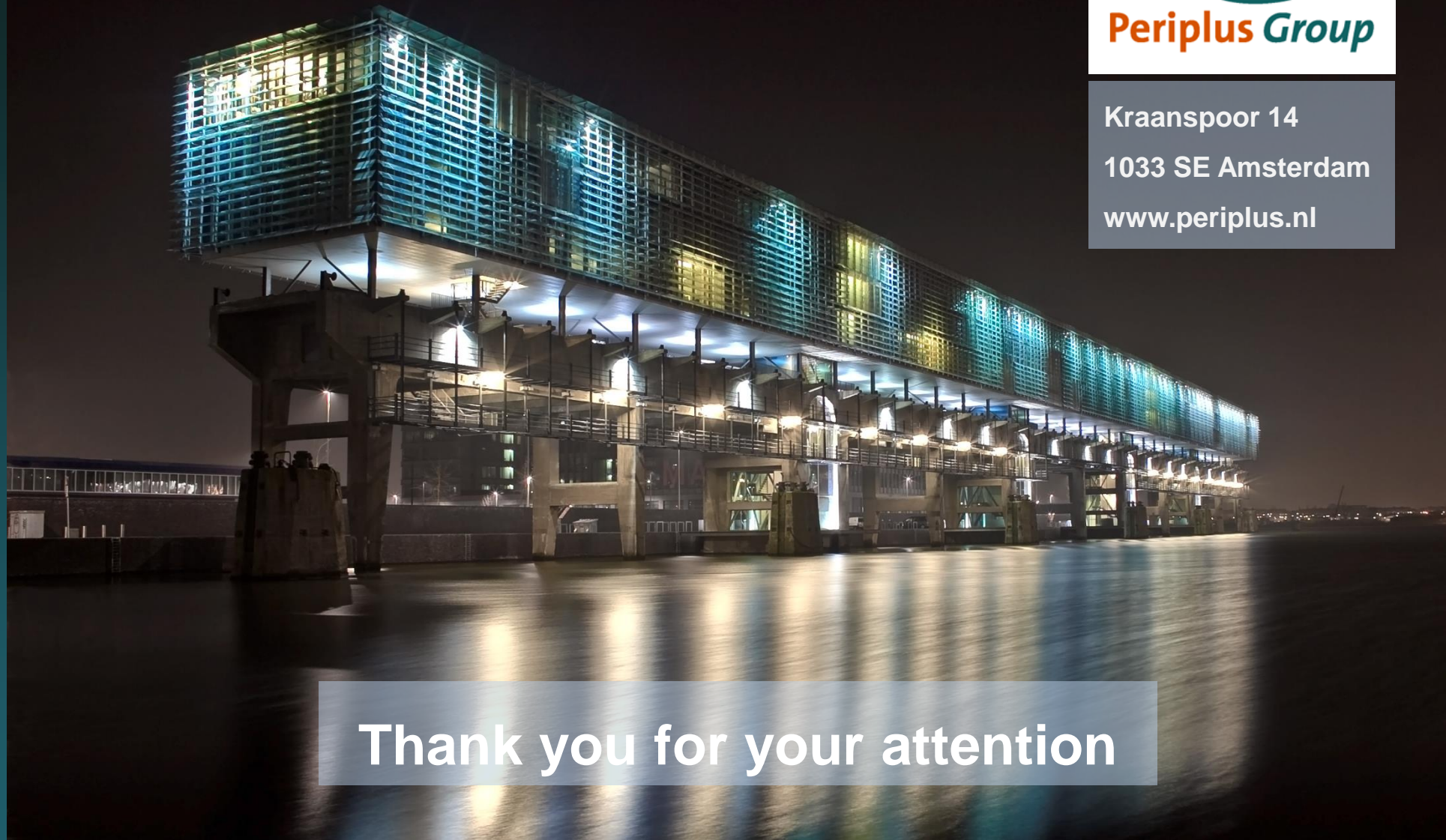
Archaeological analysis of borehole samples is still being undertaken

Recommendations

Avoid possible archeological locations (including a buffer zone of 100 meters)

Not feasible? → Additional research required

During construction: Unexpected find? → Report to the authorities



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Thank you for your attention



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>