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OLE_AO7 AREA – OWF UXO SURVEY

OLE-TEC-00035_A_REV00_FACTUAL REPORT_UXO SURVEY - OWF AREA

PROJECT No.
113401341

FACTUAL REPORT

No. OF PAGES
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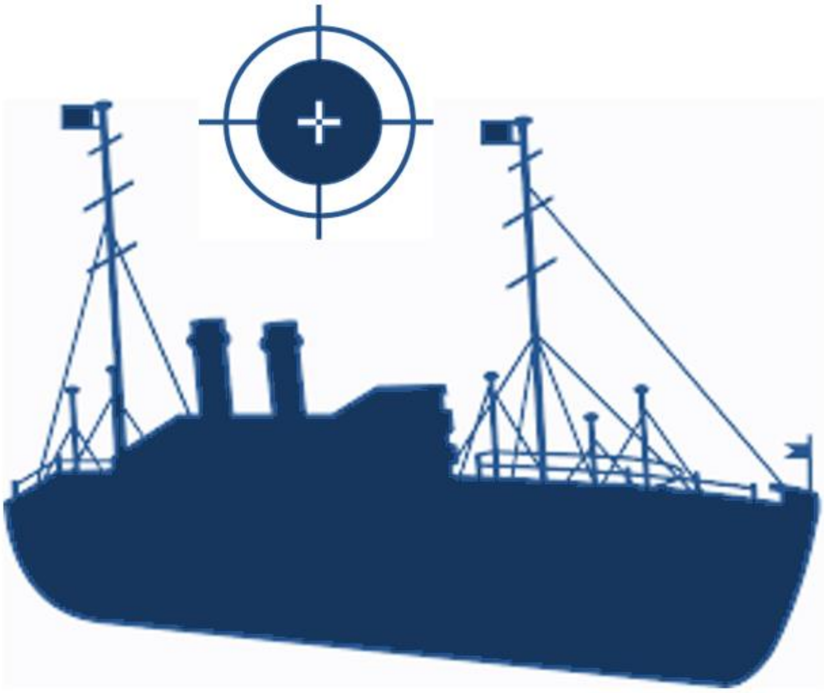

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REV	***DATE***	***DESCRIPTION***	***BY***	***CHK***	***ENG***	***PM***	***CLIENT***

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ABBREVIATIONS

ADCP	Acoustic Doppler Current Profiler
Ch	Channel
cm	Centimetre
CMP	Common Mid-Point
C-O	Computed Minus Observed
CoG	Centre of Gravity
CRP	Central Reference Point
DEMOB	Demobilisation
DGEC	Direction générale de l'énergie et du climat
DP	Dynamic Positioning
DPO	Dynamic Positioning Officer
DPR	Daily production report
EP	Environmental Protection
FLO	Fisheries Liaison Officer
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GRS	Geodetic Reference System
GSO	Geophysical Services Offshore
h	Hour
IMO	International Maritime Organization
J	Joule
JNCC	Joint Nature Conservation Committee
kHz	Kilohertz
LAT	Low Astronomical Tide

ABBREVIATIONS

m	Meters
min	Minutes
MBES	Multibeam echosounder
mm	Millimetre
MRU	Motion Reference Unit
MBES	Multibeam Echosounder System
POB	Personnel On Board
PAM	Passive Acoustic Monitoring
PPP	Precise Point Positioning
PPSU	Pulse Power Supply Unit
QA-QC	Quality Assurance – Quality Control
RTE	Réseau de Transport d'Électricité
RTK	Real Time Kinematics
s	Second
SHOM	Service Hydrographique et Océanographique de la Marine
SN	Serial Number
SRF	Ship's Reference Frame
SBP	Sub-Bottom Profiler
SVP	Sound Velocity Profiler
SVS	Sound Velocity Sensor
SSS	Side Scan Sonar
TBC	To be confirmed
TTS	TTSurvey Ltd (Seismic equipment hire company)
UHR	Ultra-High Resolution
UTC	Coordinated Universal Time
UTM	Universal Transverse Mercator
UXO	Unexploded Ordnance
VSAT	Very-Small-Aperture Terminal
WB	Water Bottom
WD	Water Depth
WGS84	World Geodetic System 1984
WT	Work time
ZH	Hydrographic Zero or Hydrographic Datum

1. INTRODUCTION

This report together with the supporting appendix, describes the results of the UXO survey conducted by Tecnoambiente with the S/V Situla in the Offshore windfarm (OWF) at OLE_AO7 area (Oléron, Gulf of Gasgone).

The objective of the site survey was to perform an UXO survey over the proposed UXO GI points (Borehole locations) over the area of interest, comprising MBES and SSS datasets.

The purpose of this was to:

- To define the final location of the GI points on the proposed box
- To detect MBES and SSS contacts
- To review proposed borehole locations for geohazards

The main objective of this was to provide the ALARP certificates necessary for a subsequent geotechnical investigation to be conducted within the zone. The survey proved to be a success and all objectives were met as detailed herein.

2. SCOPE OF WORK

2.1. SURVEY AREA

The area of interest for the UXO clearance study in the OLE_AO7 work area corresponds to the offshore windfarm (OWF), offshore substations (OSS-1 and OSS-2) and the export cable corridor (EC).
This area is located in the Gulf of Gascogne, some 40km off the coast of the Ile d'Oléron (Figure 2-1).

The offshore windfarm area is divided in two sites:

- Parc 1 (East), with an approximate area of 150 km^2.
- Parc 2, (West) with an approximate area of 280 km^2.

The total surface of the windfarm is 430 km^2 and has been surveyed as a single area.

The offshore substations, are divided in two separate sites corresponding to the windfarm where they are located (Figure 2-2):

- OSS 1. Located in the eastern edge of the wind farm with a surface of 4 km^2.
- OSS 2. Located in the north-western edge of the wind farm. This OSS-2 has in turn been divided into two, OSS-2_W and OSS-2_E, with an area of 2 km^2 each.

Regarding to the export cable, the area corresponds to 240 km^2, with an approximate length of 70 km, averaged over the different branches that comprise it.

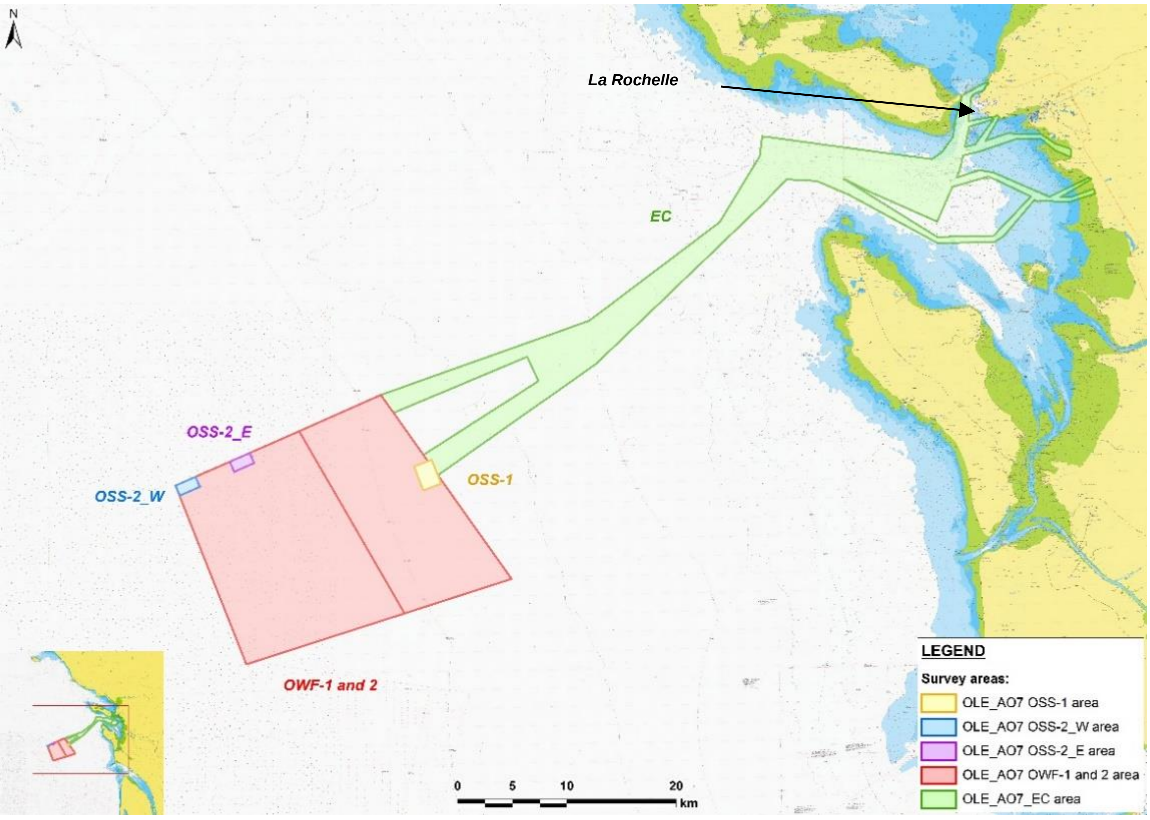


Figure 2-1: OLE_AO7 survey area.

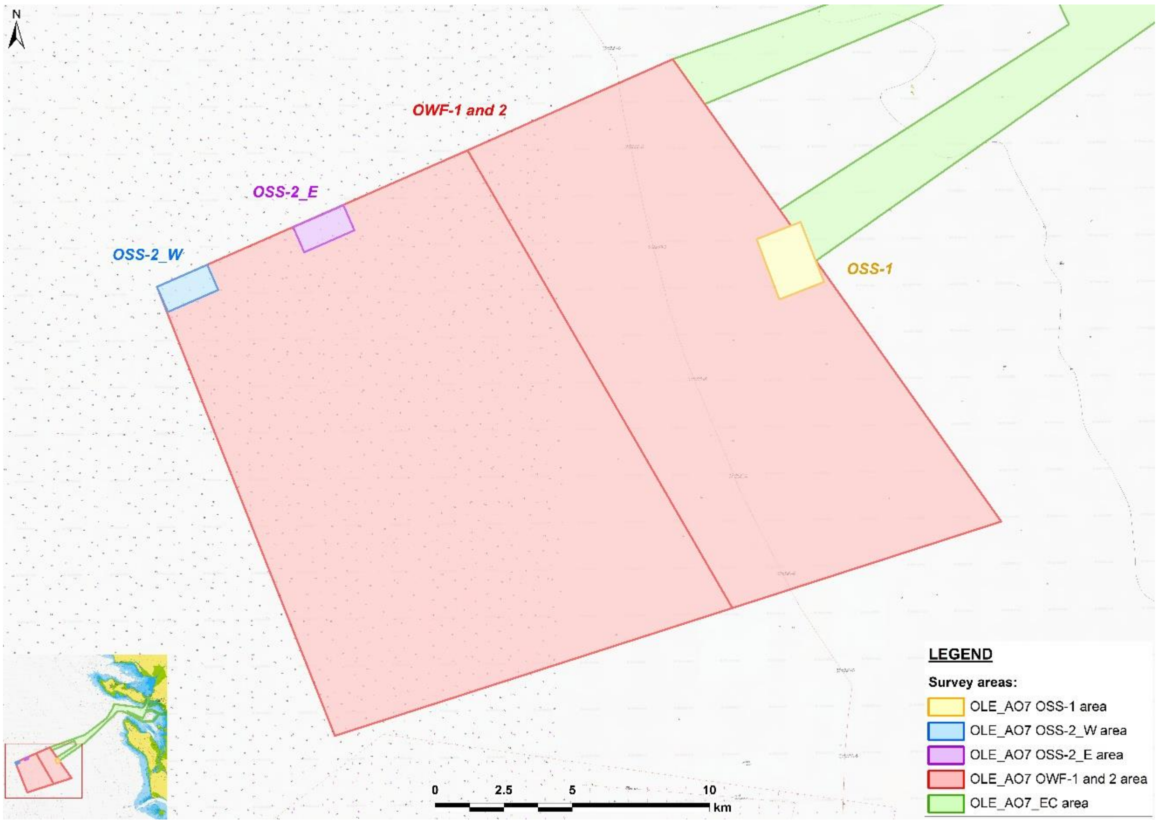


Figure 2-2: Windfarm areas (OWF), Offshore Substations (OSS) and Export Cable (EC) in the OLE_AO7 survey area.

2.2. SURVEY PLAN

A total of 17 UXO boxes were surveyed within the Offshore windfarm (OWF). Figure 2-3 indicates the location of these surveyed boxes:

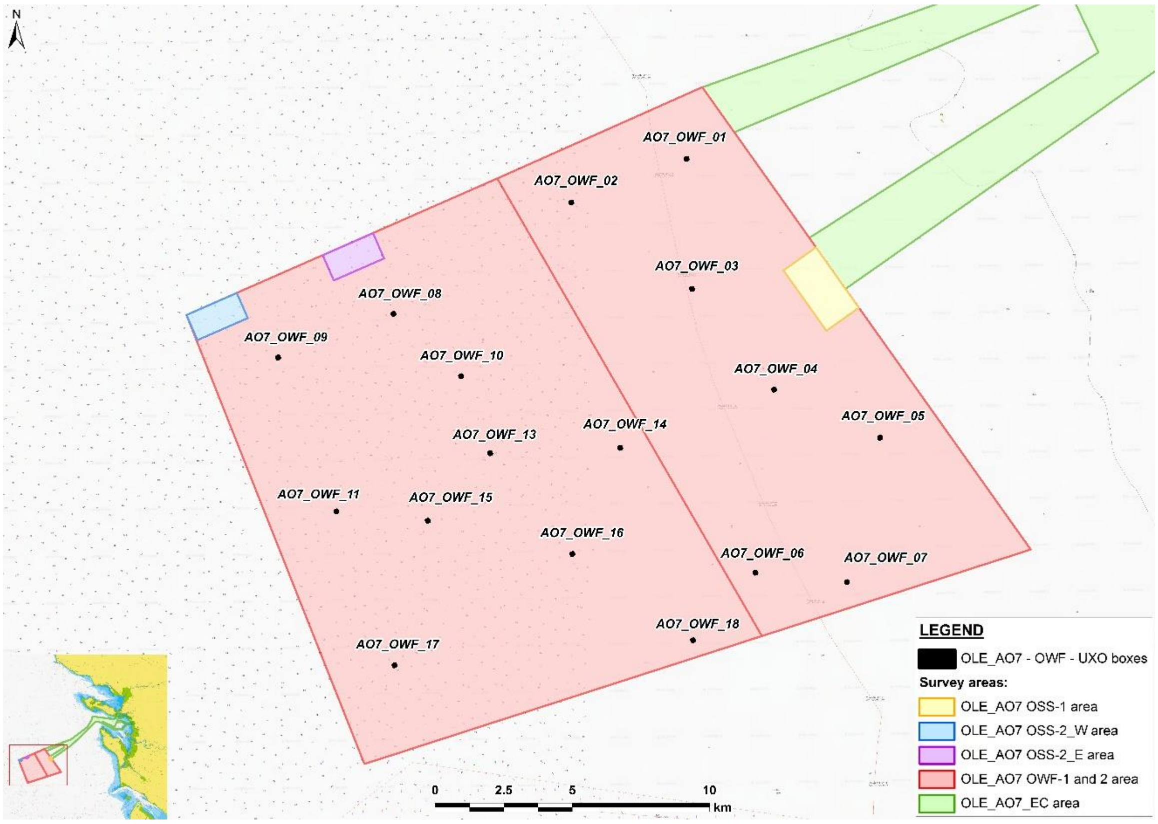


Figure 2-3: UXO box location at the OLE_AO7 Offshore windfarm (OWF).

Each of the UXO boxes comprises an area of approximately 30m x 30m, with a run in / run out length of 400 metres utilised to optimise the acquisition of the geophysical data.

Figure 2-4 illustrates the survey line plan for the UXO boxes.

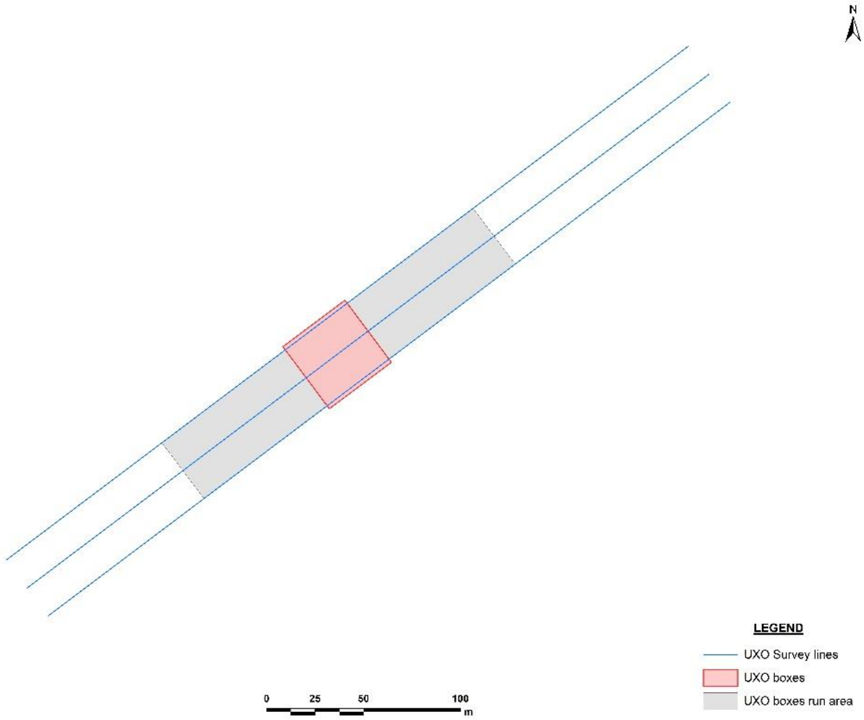


Figure 2-4: Example of UXO boxes survey line plan.

Table 1: Summary for the number of UXO boxes in the OWF of AO7 area.

SUMMARY OF NUMBER OF UXO BOXES ON SITE		
Operation	**Unit**	**#**
AO7 OWF GI Locations (UXO boxes)	*No*	17
TOTAL	***No***	**17**

Table 2: Summary for the survey line plan of the UXO boxes in the OWF of AO7 area.

SUMMARY OF LINEPLAN FOR THE UXO BOXES ON SITE		
Operation	**Unit**	**Length**
AO7 OWF GI Locations (UXO boxes)	*km*	20.40
TOTAL	***km***	**20.40**

2.3. UXO RISK ANALYSIS

During the survey planning of this project, 6-Alpha associates conducted a risk analysis of the presence of UXO elements in the OLE_AO7 work area. This report entitled "Unexploded Ordnance Threat and Risk Assessment and Risk Mitigation Strategy for Geotechnical Investigation Operations; Project: AO7 Oleron Offshore Wind Farm" (6-Alpha, 2023) details a zonation of the work zone into three categories: Low, Medium and High risk. This zonation is presented in the figure below (Figure 2-5).

As agreed with the client, based on the risk presented by 6-Alpha in its study, it was established that:

- In areas whose UXO risk is Low or Medium, data acquisition for UXO detection would be performed with MBES and SSS.
- In areas with High UXO risk, data acquisition for UXO detection would be performed with MBES, SSS and MAG.

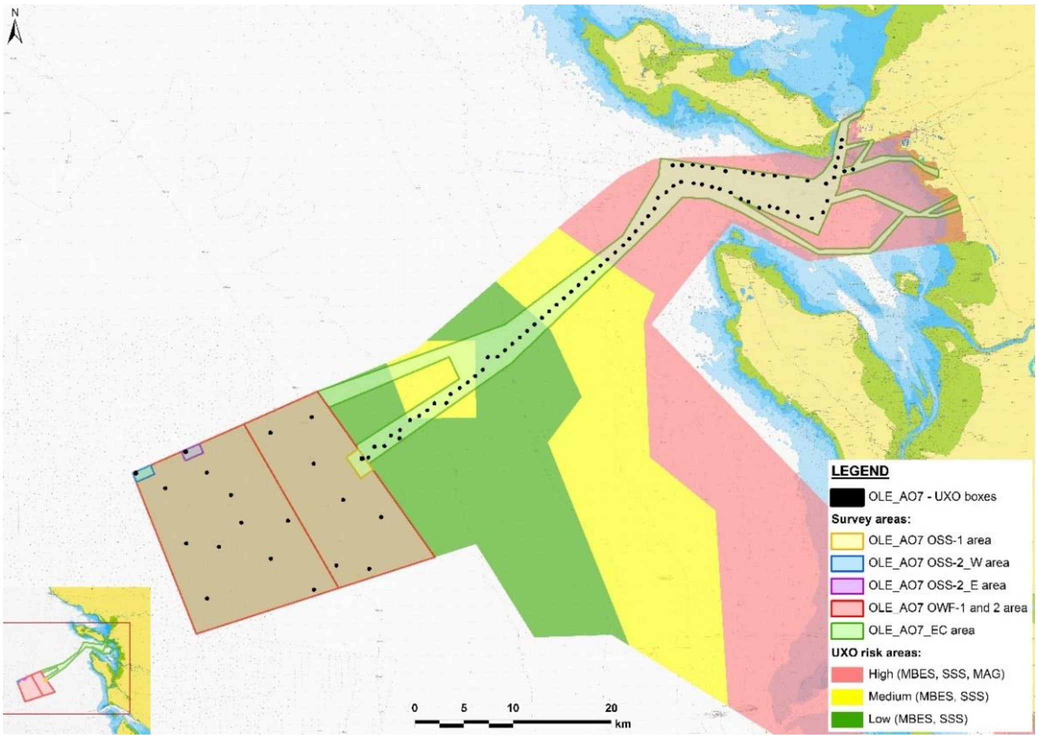


Figure 2-5: UXO risk analysis for the OLE_AO7 OWF, OSS-1 and 2 and EC survey areas.

It is observed in the zonation that the working areas of the OWF and OSS-1 and 2 the UXO risk is Low.

3. SURVEY CONTROL

3.1. GEODETIC PARAMETERS

3.1.1. Survey datum

These parameters are detailed below.

Table 3: Datum parameters table

DATUM	
Survey Datum:	WGS 84
Spheroid	GRS 1980
Semi-Major Axis (a)	6,378,137.000
Semi-Minor Axis (b)	6,356,752.1424
Inverse Flattening (1/f)	1/298.257223563

Table 4: Projection parameters table.

PROJECTION	
Projection	UTM
False Easting	500000
False Northing	0
Latitude of Origin	0º00’00.000000’’
Central Meridian	3º00’00.000000’’
UTM Zone	30 N

PROJECTION	
Scale Factor on CM	0.9996
Units:	Meters

3.1.2. Vertical datum

The vertical datum used in the QINSy software is Bathyelli v2.0 ZH geoid published by the SHOM in December 2013. The Bathyelli v2.0 ZH (SHOM 2013) is a surface based on the GRS 1980 spheroid, and it is a set of surfaces each of which defines the separation of one vertical datum from the WGS84 ellipsoid to the vertical maritime reference Hydrographic Datum or Hydrographic Zero. These ellipsoidal heights are given in meters.

This geoid covers the intersection between the SHOM tidal model and the different tidal zones of France.

For the survey area OLE_AO7, the corrections to hydrographic zero are made by tidal observations of the port Port-La Rochelle-La Pallice (46º 10' N, 01º 13' W). The difference between the hydrographic zero and the LAT reference level for this port is 0.17 m, according to the study by SHOM "*Références Altimétriques Maritimes. Ports de France métropolitaine et d'outre-mer*" of 2019.

3.1.3. Tidal reduction

To carry out the survey as accurately as possible, Tecnoambiente is receiving MarineStar PPP corrections by satellite signal. When using an accurate GNSS system, the tidal corrections are carried out in real-time through QINSy computations, as it is shown in the following figure.

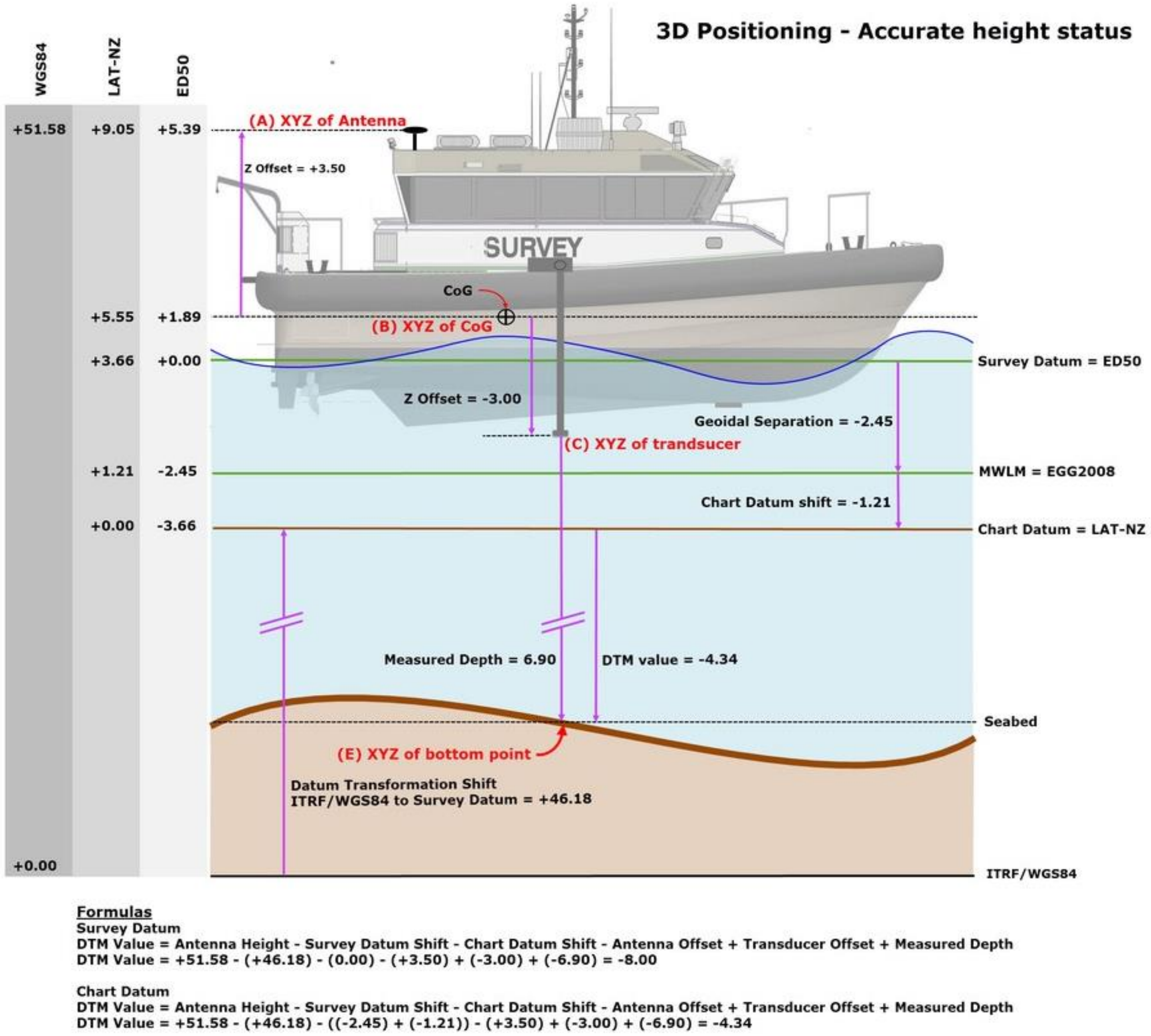


Figure 3-1: QINSy's method for accurate tide calculation.

In the event that corrections drop out they can be applied in post processing.

4. QA/QC CHECK

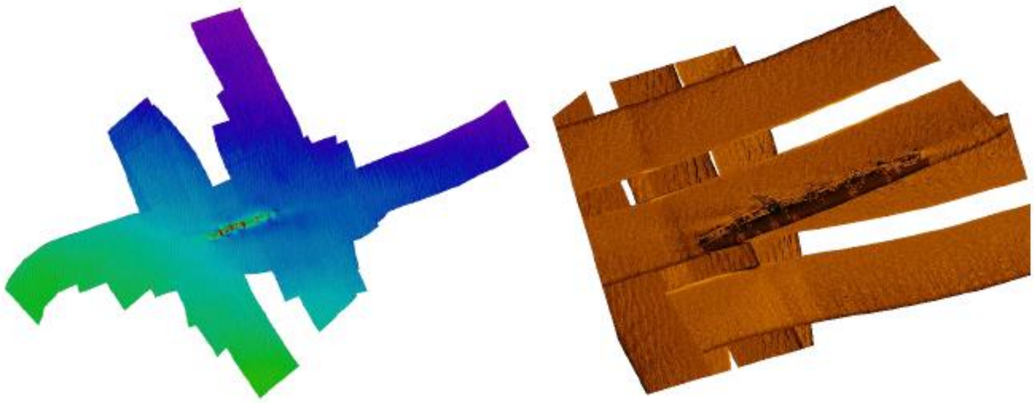
The processed values obtained from the onboard processing team during the survey are checked before the ALARP certificate phase. This quality control check of the input data enables to validate the quality of the processing method. Here is the QA/QC for the measurements made.

Below are presented the QA/QC checks made for the measurements:

- QC0: Check of the geophysical value
- QC1: Check of the sensor position
- QC2: Check of the altitude of sensor and dynamic coverage
- QC3: Check of the noise
- QC4: Check of the speed and sampling frequency

5. SIDE SCAN SONAR CALIBRATION

To verify the sub-surface positioning system (USBL) and in addition the Side Scan Sonar (SSS) position, a survey was carried out over a ship wreck (Brackenfield Wreck). The prow has been precisely identified with MBES data. This makes it possible to estimate the precision of the survey positioning by calculating the distance between the position of the prow measured by the MBES and by the SSS.



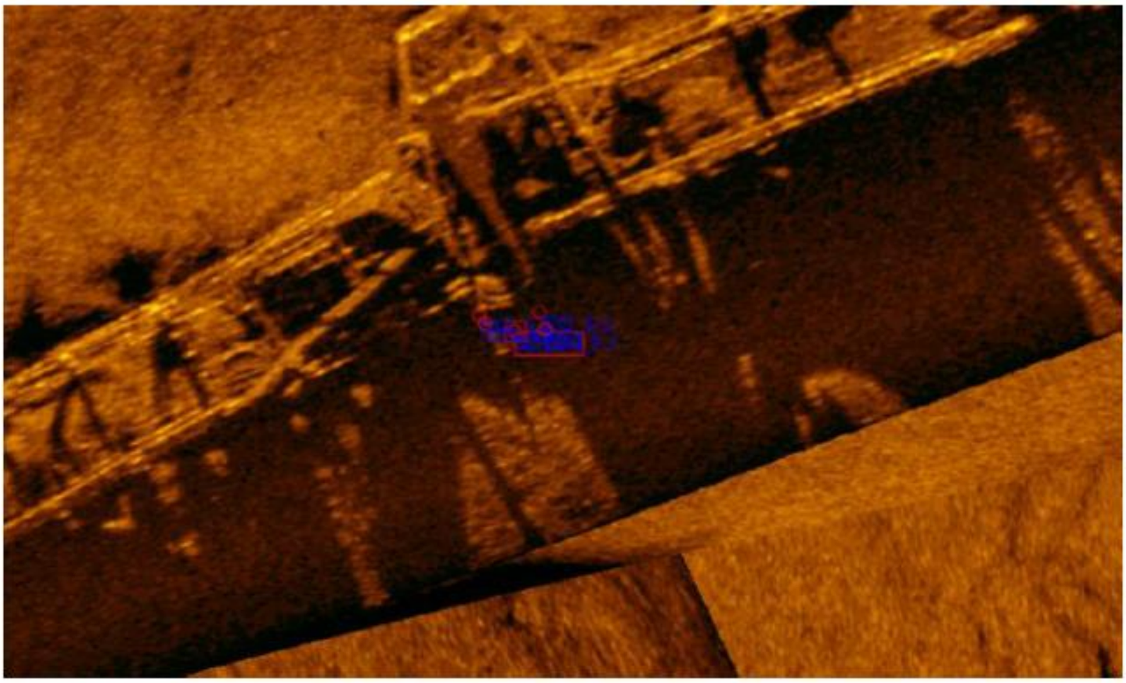


Figure 5-1: MBES model and SSS mosaic used for the positioning verification and targeting results.

The average measured offset from the targets was less than 1.2 m compared to the position observed in the MBES data.

6. METHODOLOGY

6.1. MBES BATHYMETRY

6.1.1. Data acquisition

The objective of this phase of data acquisition is the detection of possible MBES targets lying on the seabed. Due to the coverage requirements of gradiometer data acquisition, this required total coverage of the seabed within each of the UXO boxes, and hence a survey line spacing of 18 m for the Low and Medium UXO risk boxes.

During the data acquisition, the vessel's master must follow the previously programmed routes of the project lines, governed by the indications of the computer screen (Helmsmann indicator), which is shown, by means of visual and audible alarms, when it separates from its course more than a specified amount (variable according to weather conditions in the area, but never more than 2.5 metres from the theoretical line), and also when there is a problem in a peripheral, such as the loss of GPS corrections.

While the master follows the navigation lines, the acquisition module of the hydrography program captures all the position data sent by the GPS, as well as the soundings sent by the multibeam sounder for each transmission pulse, as well as the values of the heading, wave height, roll and head angles sent by the MRU.

Parallel to the data entry, the data acquired by the equipment and peripherals is synchronized. This process is carried out using the hydrographic processing software QINSy, complemented by the input of the time and the pulse per second (PPS) provided by the MRU, so that all the data is time synchronised.

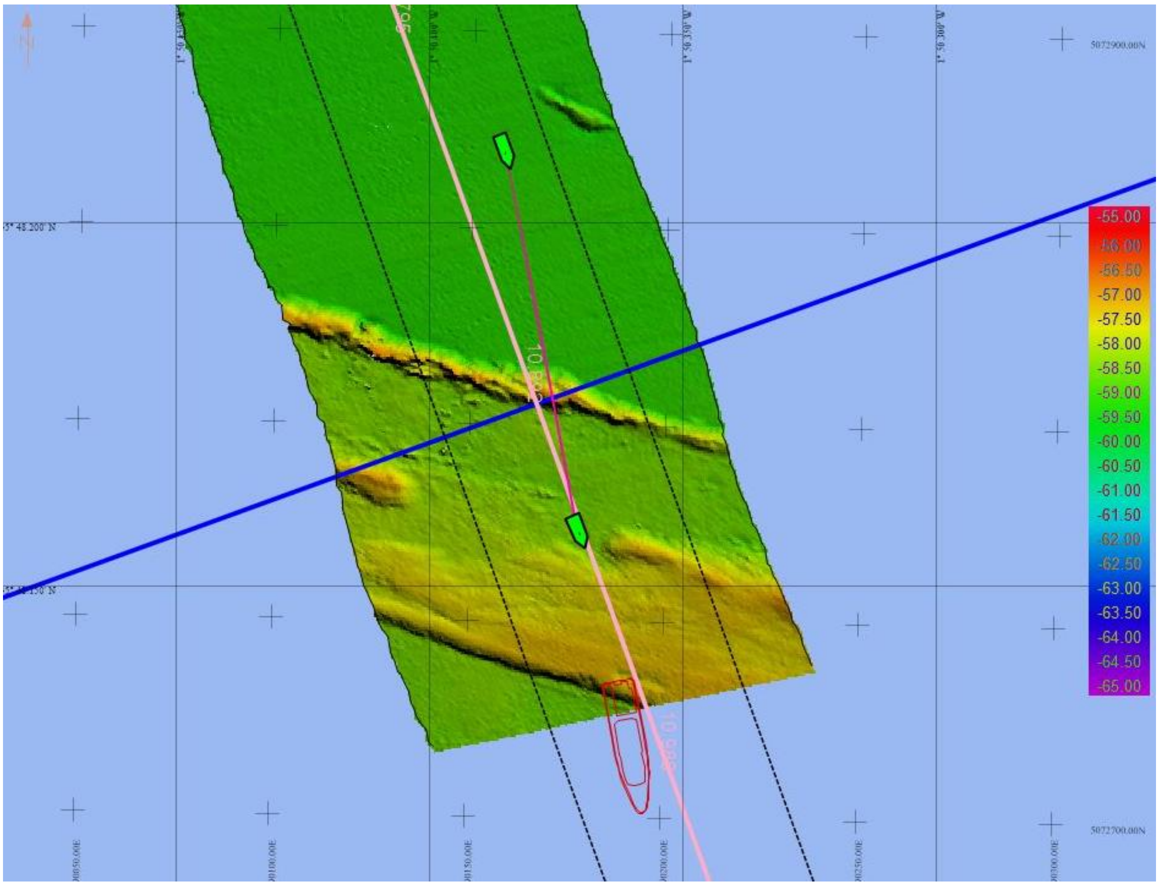


Figure 6-1: MBES bathymetry data acquisition with the QINSy software.

6.1.2. Data processing

During the processing phase of acquired data, the lines on the screen are processed, to manually correct any noise that appears in the records. Noise is produced by multiple factors such as, multipath in position, air bubbles, cetaceans, motor interference from the vessel, etc., in the digital register of soundings.

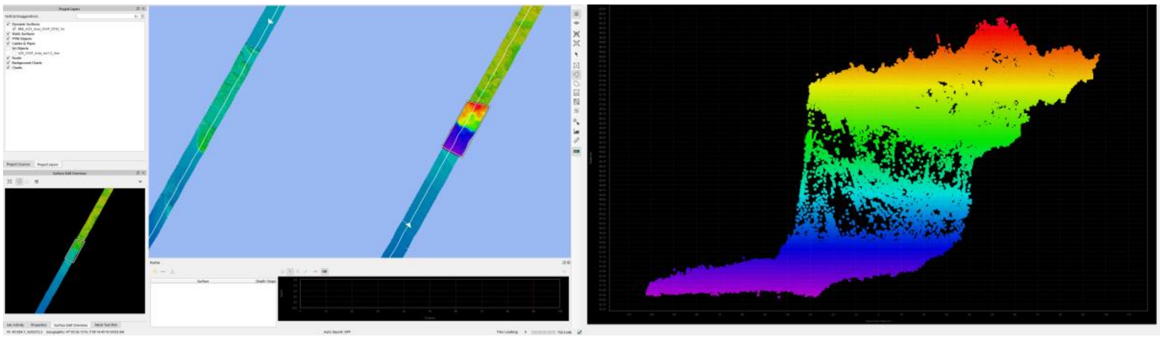


Figure 6-2: Processing screen of MBES bathymetry data with the Qimera software.

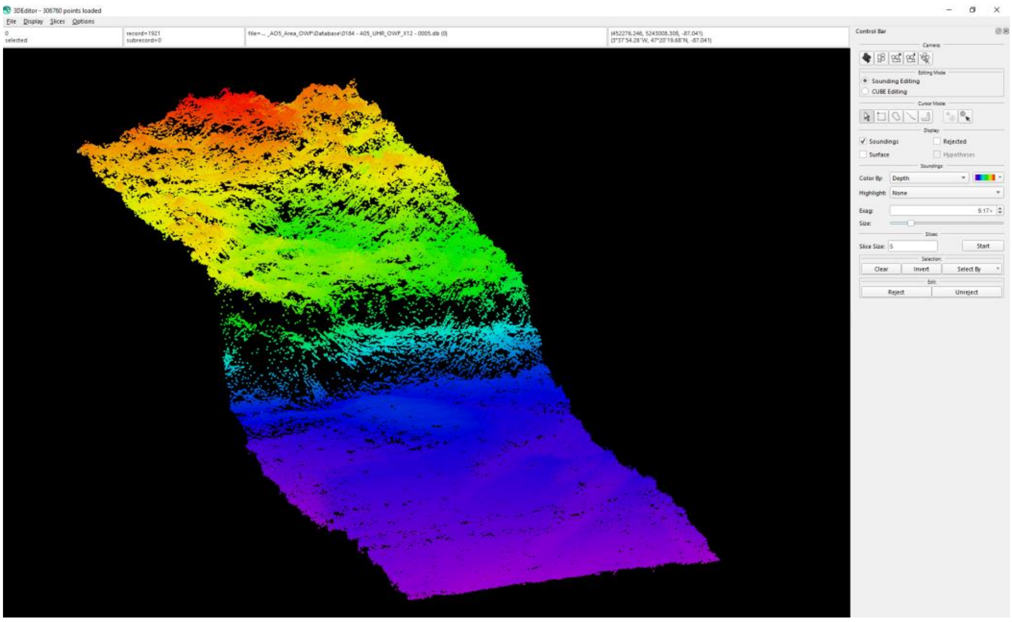


Figure 6-3: 3D image of the MBES bathymetry processing.

Once any possible existing errors in the records were deleted, a digital model of the terrain with 0.25 x 0.25 m grid size was produced, with a minimum cell size to obtain the maximum resolution of the seabed.

The general MBES processing workflow is presented in the following figure.

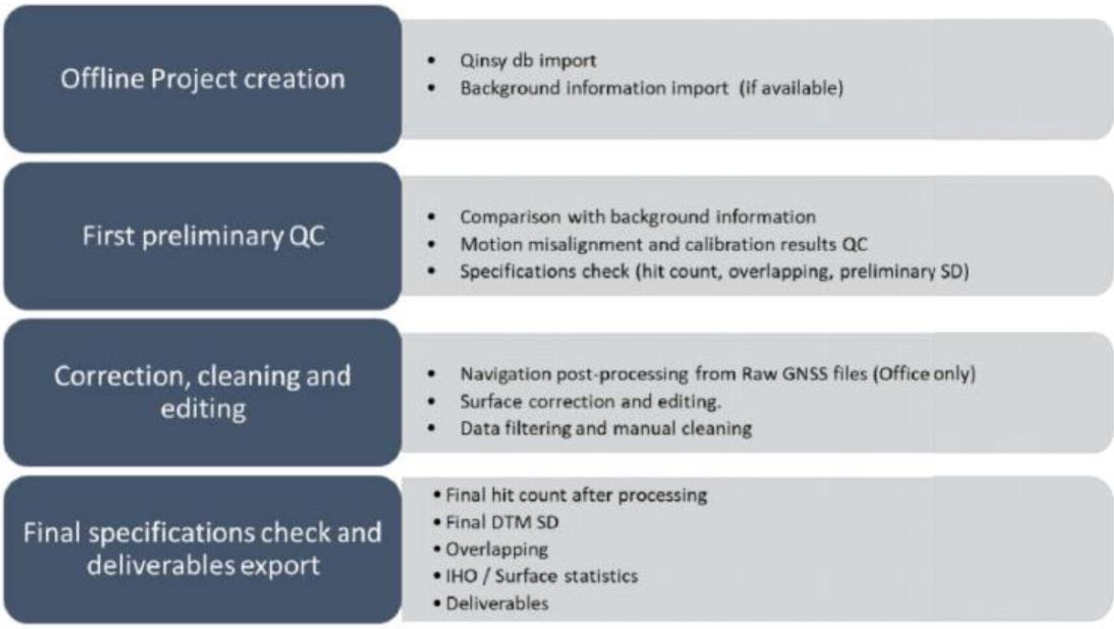


Figure 6-4: MBES bathymetry processing overview.

Digital terrain models (DTM) are created in Qimera. Once done, the DTM’s are exported as 32bits RGB Geotiff, for each of the UXO boxes.

6.1.3. Target picking

The target picking was done using a GIS platform to detect and digitize the contacts present over the seabed surface.

6.2. SIDE SCAN SONAR

6.2.1. Data acquisition

The objective of this phase of data acquisition is the detection of possible sonar targets lying on the seabed. Due to the coverage requirements of gradiometer data acquisition, this required total coverage of the seabed within each of the UXO boxes, and hence a survey line spacing of 18 m for the Low and Medium UXO risk boxes.

A side scan sonar system comprises a processing unit connected through a cable to a wet unit that transmits and receives acoustic energy. Side scan sonar can determine seabed morphology and configuration by means of acoustic signals. It can also determine its composition, identifying different seabed strata as hard (rocky or consolidated), soft or sedimentary, as well as identifying areas of seagrass.

Side scan sonar systems can work in different frequency ranges: systems working in high frequencies, (between 500 kHz and 900kHz) offer higher resolution but lower ranges, with systems working in low frequencies (100 kHz), offer lower resolution but higher ranges. For this survey, a frequency of 900KHz was utilised. The reflection of the signal coming from the seabed is detected by the same transducers, amplified and transmitted to the control unit, and recorded and displayed on the computer screen, providing an acoustic map. With this data, it is possible to identify different seabed morphologies, together with the visualization of any seabed objects.

When the vessel is underway, the winch operator can start deploying cable until the fish gets to the desired working depth of about 6 m above the seabed.

6.2.2. Data processing

Once the SSS data were acquired and then exported into JSF format, the files are imported into the SonarWiz 7 software. Channels 3 and 4 were used for recording the high frequency data.

After data importation into the SonarWiz 7 software, an initial navigation correction was made for each imported file, applying smoothing filters to avoid errors in the heading of the tow fish. The track position was smoothed using a mean value of 300 pings.

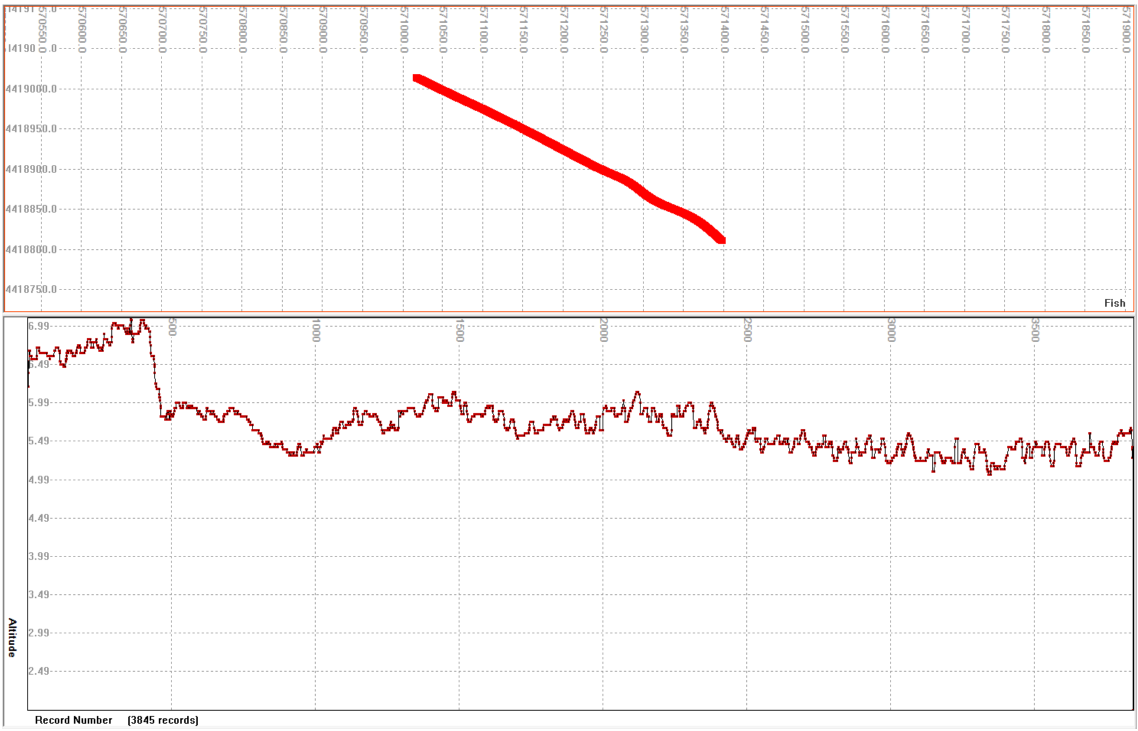


Figure 6-5: Navigation editor in SonarWiz 7.

After the aforementioned corrections were implemented, the water column for each file was eliminated, by applying the bottom-tracking acquired during the survey, as shown in Figure 6-6. If bottom-tracking of the tow fish failed during the survey, it was done automatically by applying filters or by drawing the seabed manually during post-processing. This enables slant range corrections for the digital data to be as accurate as possible.

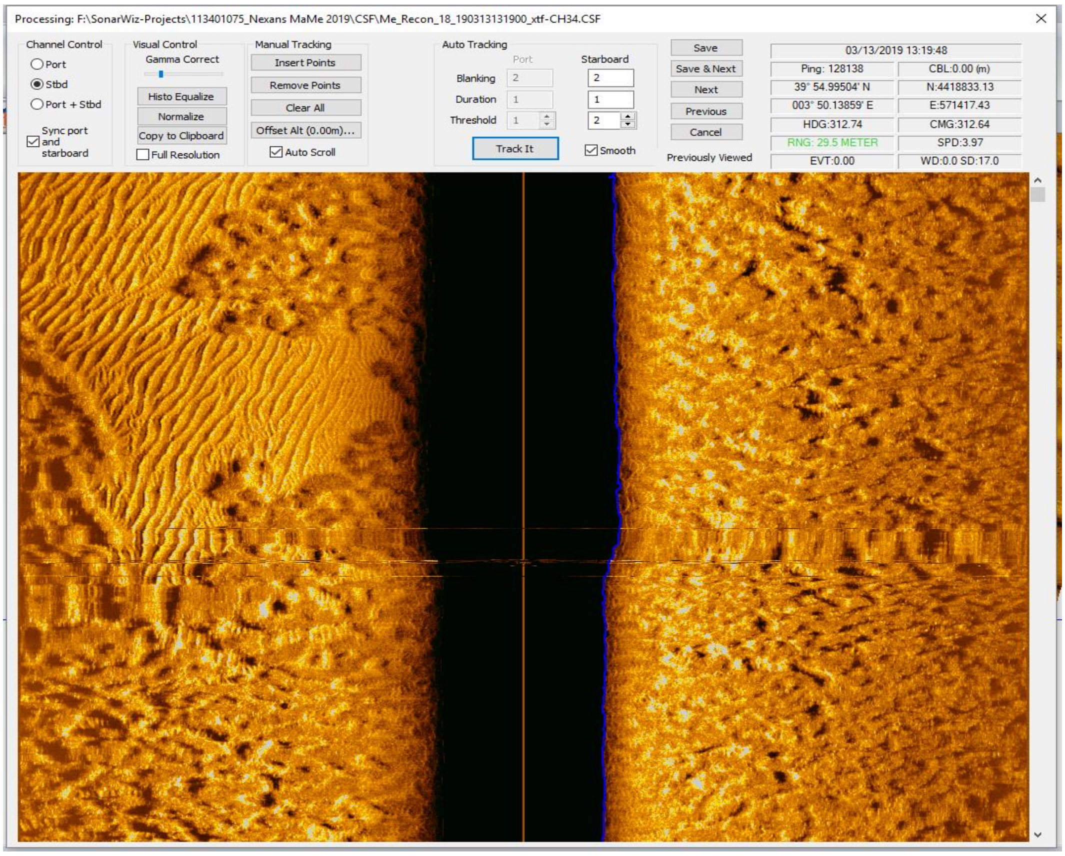


Figure 6-6: Bottom tracking processing drawn in blue in the SonarWiz software.

The following steps during SSS processing in the SonarWiz 7 software are the application and enabling of the EGN filter, and the enabling of the de-stripe filter.

At this point during data processing, a processed MBES geotiff is imported into the project. Using the MBES information, rotations to the SSS file are applied, in order to match feature orientations seen in the MBES data. Where necessary, a move offset can be applied to the SSS file, in order to match features within the MBES data.

The final processing step is the export of the sonar files into a GIS software package, where all of the information is integrated, and a sonar mosaic is generated. This is carried out by converting the JSF files into 32bits RGB Geotiff images, to obtain georeferenced images of the processed data, with a resolution of 0.1 m.

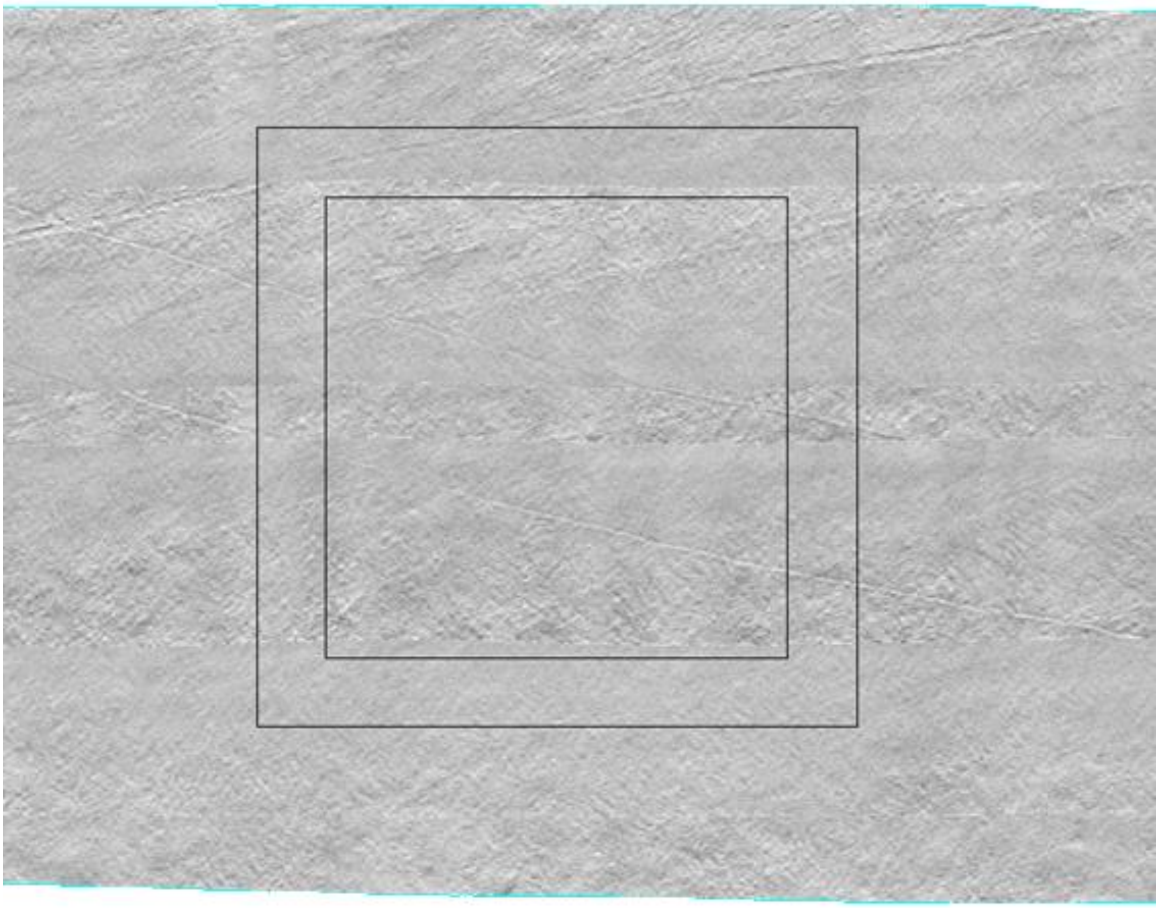


Figure 6-7: Example of an UXO box 32bits RGB SSS Mosaic with a resolution of 0.1 m.

6.2.3. Target picking

The picking of the targets was carried out on the sonograms with the “Digitizing View” tool.

When an object is detected, it can be pointed and measured with the length, the width, and the shadow on the sonogram. The software calculates the height automatically.

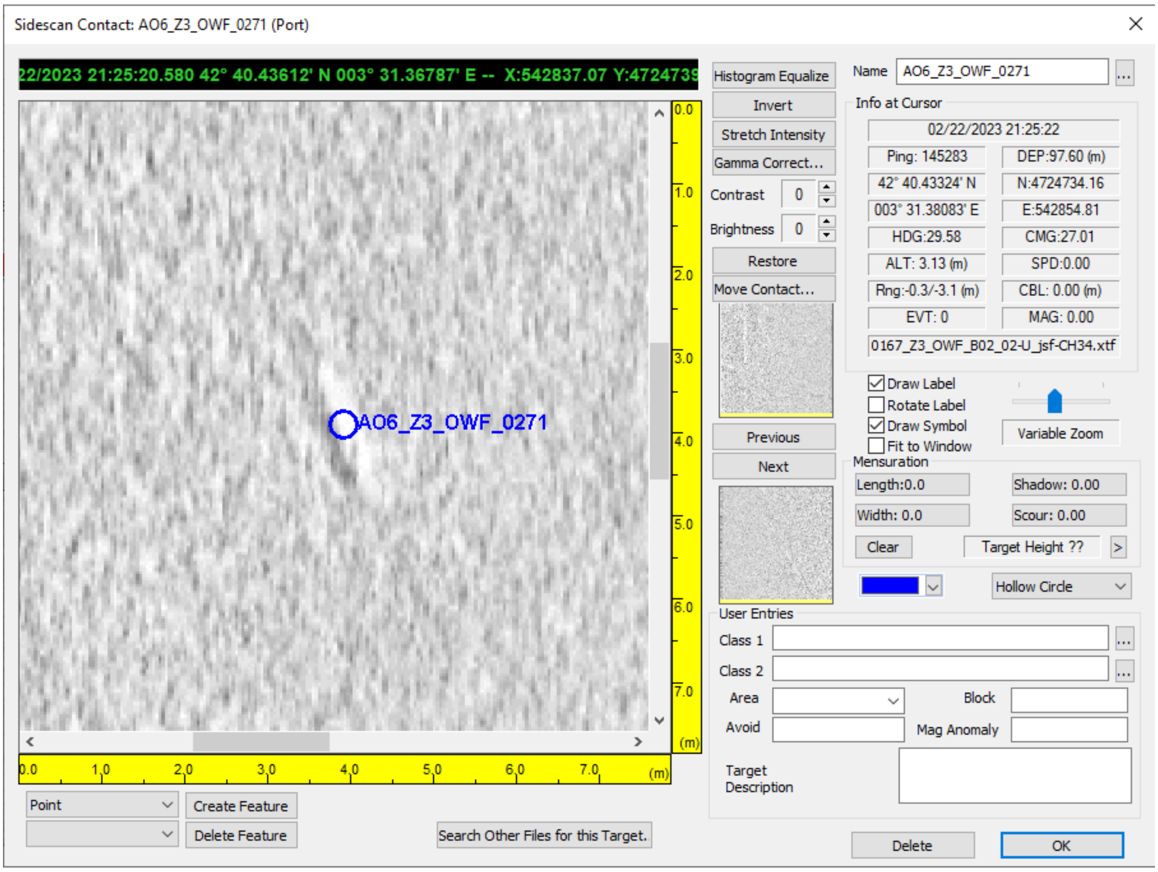


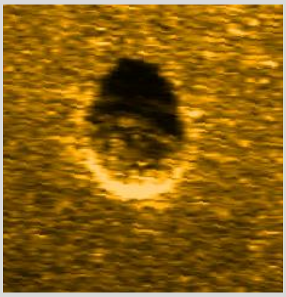
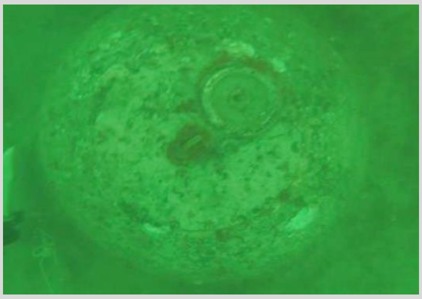
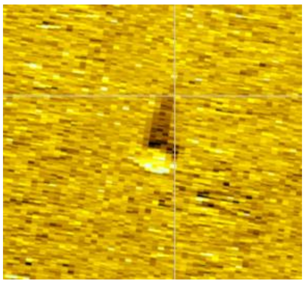
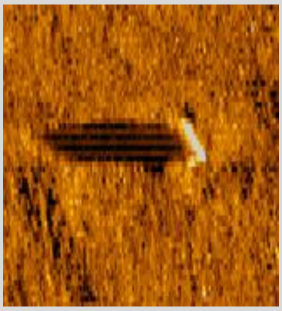
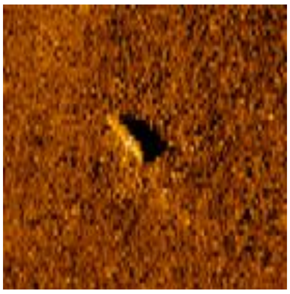
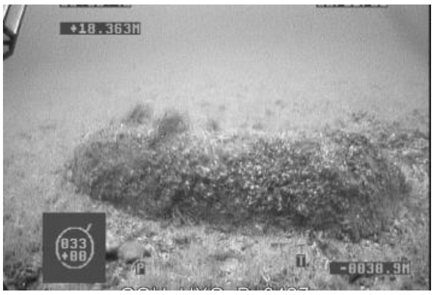
Figure 6-8: SonarWiz targeting tool.

Detection has been performed for all the objects / anomalies / obstructions that have were detected during the observation of the sonograms. As a lot of rocks and boulders are present on the seafloor and to prevent to pick too many targets with geological origins, it has been decided to pick:

- Objects that are isolated within a quiet and/or sandy environment.
- Objects that have an unusual shape or that looks hand-made or non-natural.

Below, in Table 5, a bibliographic comparison of detected sonographies is presented, showing the similarities between boulders and UXO.

Table 5: Comparison of sonar image of UXO and boulders using SonarWiz.

Sonar image	Photography	Identification
		RMAK Mine *(Cherbourg)*
		Boulder *(Normandie)*
		BM1000 *(Normandie)*
		Boulder *(Normandie)*

7. RESULTS

7.1. TARGET PICKING

Side scan sonar anomalies were picked all along the side scan sonar lines, and not only in the vicinity of the UXO boxes. Side scan sonar anomalies detected are listed in Appendix II.

7.2. DISCRIMINATION OF pUXO TARGETS

The identification of punctual objects has been made but can't specify if there are ferromagnetic elements. It can therefore be difficult to distinguish anthropogenic elements from geological elements (boulders, gravel, coarser sediments, etc.).

Any anomaly can therefore correspond to a potential UXO

8. AVOIDANCE DISTANCES

Following the analysis, we are looking for as low as reasonably practicable (ALARP), areas that can be considered clear of any pUXO. The avoidance criteria have been defined following the UXO threat and risk assessment with geotechnical investigation risk mitigation strategy recognised and the desktop studies (Ref. 01):

Thus, the avoidance distance can be calculated as follows (Figure 8-1):

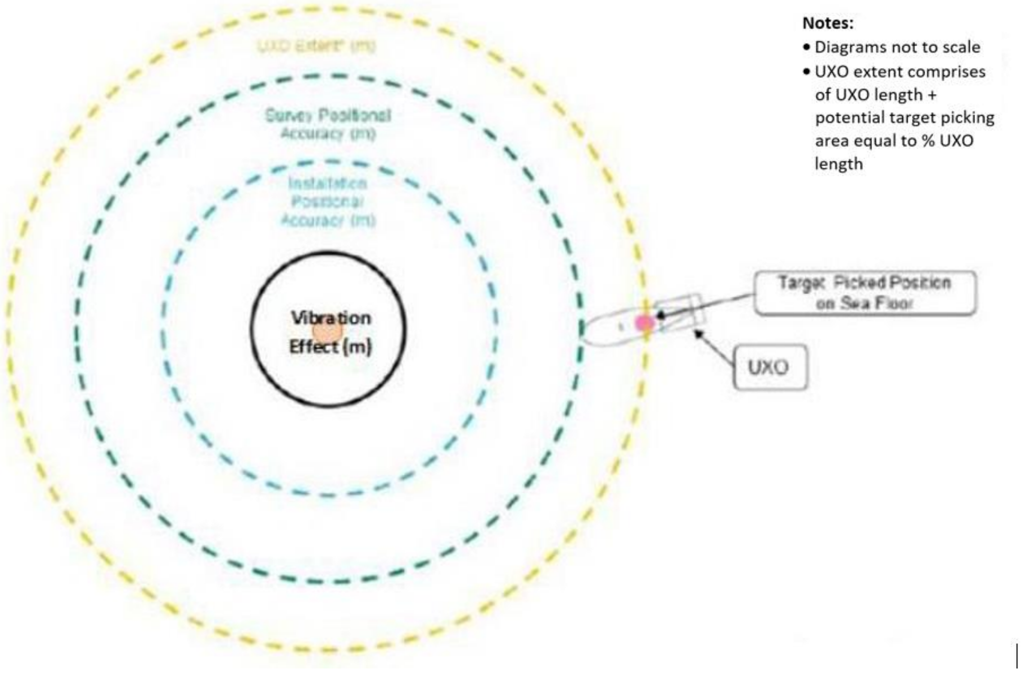


Figure 8-1: Avoidance distances.

Avoidance distance = Geotechnical tool width + Vibration effect distance + Geotechnical tool positioning accuracy + UXO survey accuracy + Ammunition length

The effect of the generation of seismic waves during vibro-driving or pile driving has to take in account in the case of geotechnical drilling or pile driving. The machines generate a wide variety of seismic waves (pressure, Rayleigh shear) (*Study report DRS17-164706-11171B, INERIS*) that can trigger UXO detonation. This effect should not be considered for other geotechnical work such as jack up or anchor installation.

For the OWF area, the 15 m buffer has been applied as avoidance distance according to the document delivered by 6 Alpha Associates Limited (Ref. 01).

A safety buffer of 15 m is to be employed from any isolated anomaly.

This was achieved through geospatial processing by QGIS software.

First, the areas that could not be considered as white areas are mapped, grouping the pUXO targets (MBES, SSS and MAG contacts) and potential saturated areas. Afterwards, the "avoidance areas" are mapped with an avoidance zone of 15 meters (a 15 m safety buffer around the anomaly) away from all the potential UXO (pUXO) anomalies or any saturated or excluded areas. This avoidance area is also applied from the edge of the dataset inwards the centre of the survey area.

Then the free space between these avoidance areas and the detection surface and the survey limits is mapped, and a workable area is obtained.

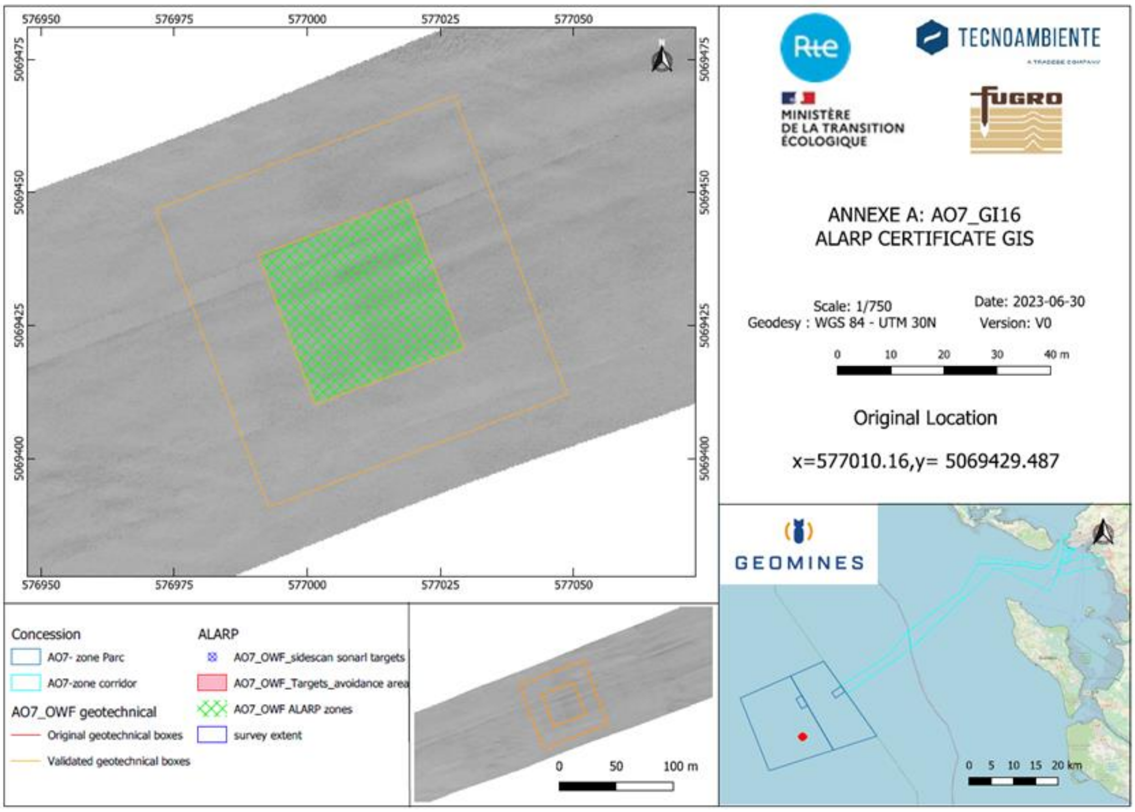


Figure 8-2: Example of ALARP validated area at the original location.

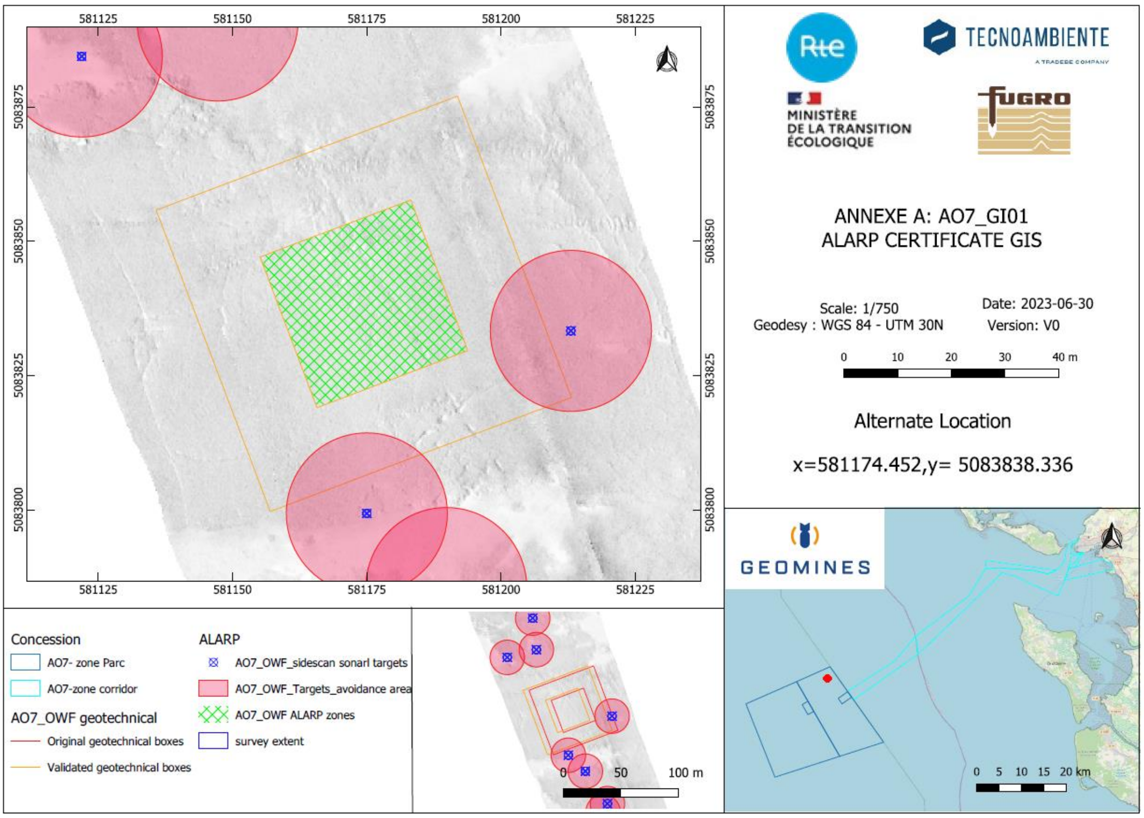


Figure 8-3: Example of ALARP validated at an alternate location 5m NW of the original location.

9. CONCLUSION

ALARP areas of 15.300 m^2 has been found for the 17 GI locations over the OWF area. An alternative location has to be found for 2 positions. These alternative locations are indicated in grey in Table 6.

Table 6: Final ALARP workable areas and GI box location.

ID	GI box	Easting (m)	Northing (m)
AO7_OWF_GI01	1	581174.452	5083838.34
AO7_OWF_GI02	2	576970.821	5082245.38
AO7_OWF_GI03	3	581369.598	5079098.78
AO7_OWF_GI04	4	584365.452	5075421.17
AO7_OWF_GI05	5	588228.167	5073672.37

ID	GI box	Easting (m)	Northing (m)
AO7_OWF_GI06	6	583683.596	5068747.7
AO7_OWF_GI07	7	587020.312	5068406.78
AO7_OWF_GI08	8	570487.471	5078187.57
AO7_OWF_GI09	9	566278.864	5076594.56
AO7_OWF_GI10	10	572952.35	5075912.84
AO7_OWF_GI11	11	568402.865	5070983.1
AO7_OWF_GI13	13	574014.341	5073107.1
AO7_OWF_GI14	14	578753.945	5073297.22
AO7_OWF_GI15	15	571739.587	5070642.24
AO7_OWF_GI16	16	577010.16	5069429.49
AO7_OWF_GI17	17	570526.789	5065371.6
AO7_OWF_GI18	18	581408.809	5066282.84

10. REFERENCES

In accordance with:

- Letter the "*Inspection des poudres et explosifs*" of the French Ministry of Defence and the *"Direction générale du Travail*" of the French Ministry of Labour of September 18th, 2013, relating to pyrotechnic clearance carried out on civil land.
- Decree No. 2014-381 of March 28, 2014, regulatory part Art. R.733-1 to 16 and legislative part Art. L. 733-1 to 3.

In reference to:

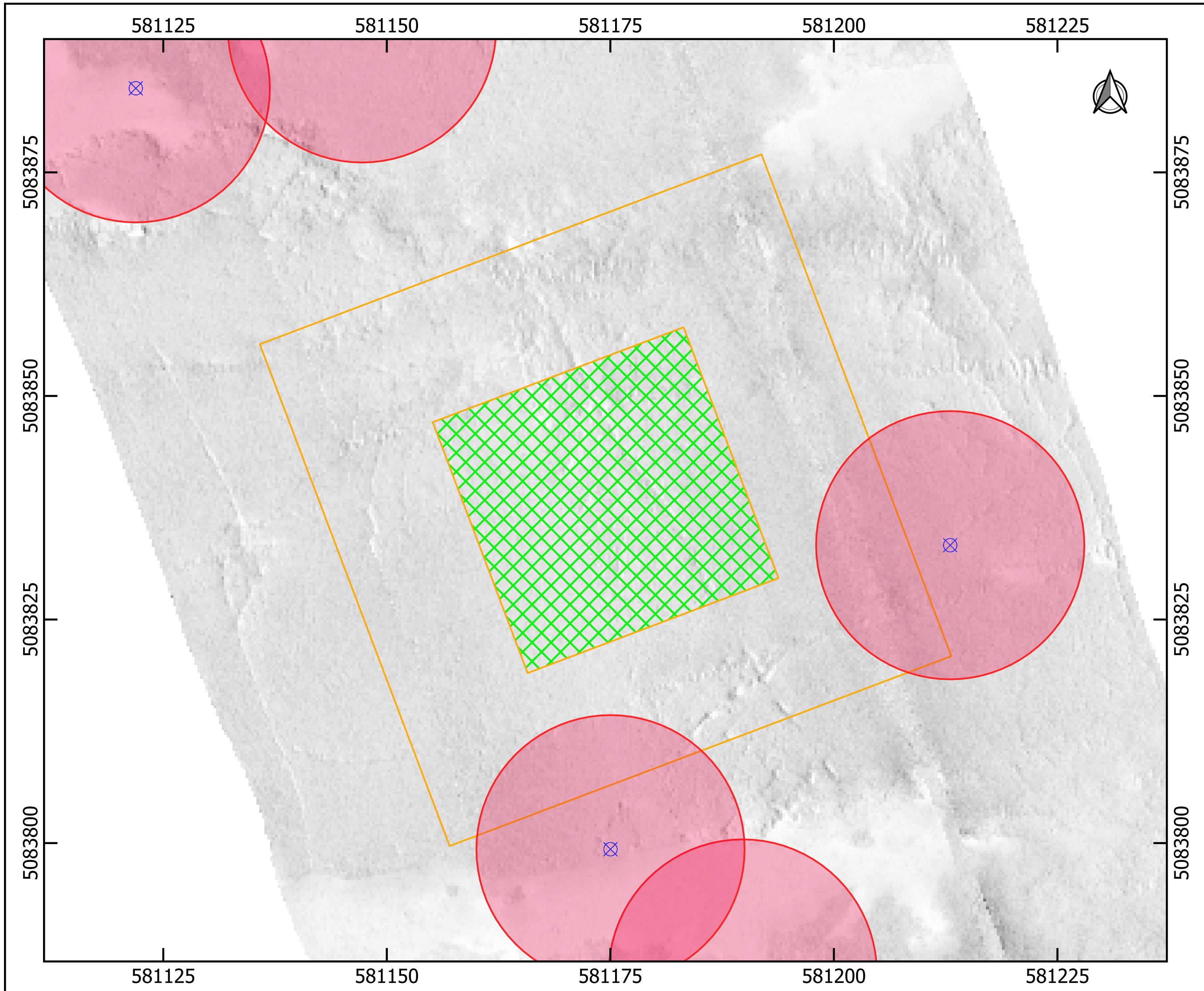
- Decree No. 2005-1325 of October 26, 2005, amended from the Ministry of Defence relating to the safety rules applicable during work in the context of a pyrotechnic clearance site and the two implementing decrees.

Ref.01. Unexploded Ordnance Threat and Risk Assessment: *9407_UXOTARA_AO7_Oleron_DNV_V3.*

Ref.02. Parc Eolien en mer et son raccordement au large de l'Ile d'Oleron (AO7) analyses hydrosedimentaires et morphodynamiques, Actimar, 25 fevrier 2022

Ref 03. OLE-GEN-TEC-00022_IFR_rev00_Mobilisation report_UXO survey_AO7 area

APPENDIX I – ALARP CERTIFICATE MAPS



ANNEXE A: AO7_GI01
ALARP CERTIFICATE GIS

MINISTÈRE DE LA TRANSITION ÉCOLOGIQUE

Scale: 1/750
Geodesy : WGS 84 - UTM 30N

Date: 2023-06-30
Version: V0

0 10 20 30 40 m

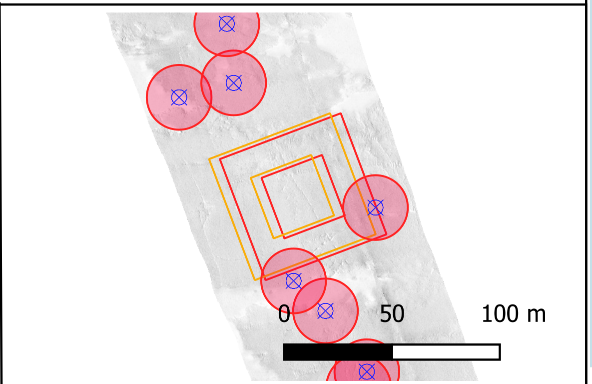
Alternate Location

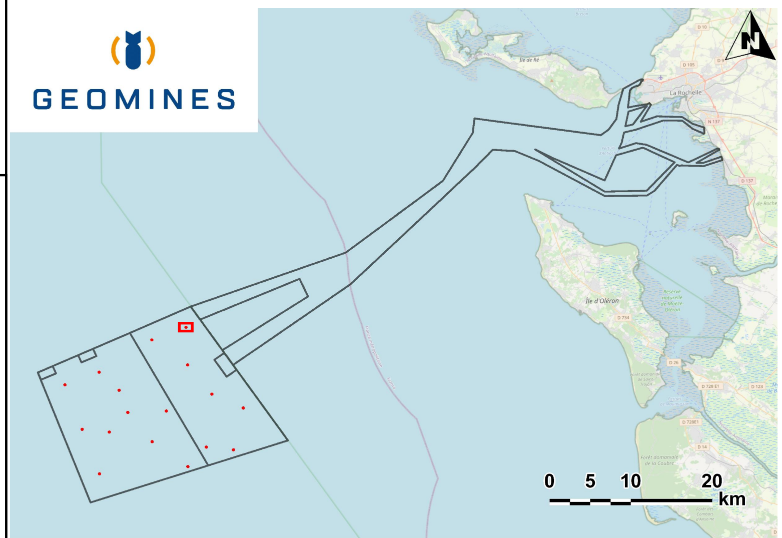
x=581174.452,y= 5083838.336

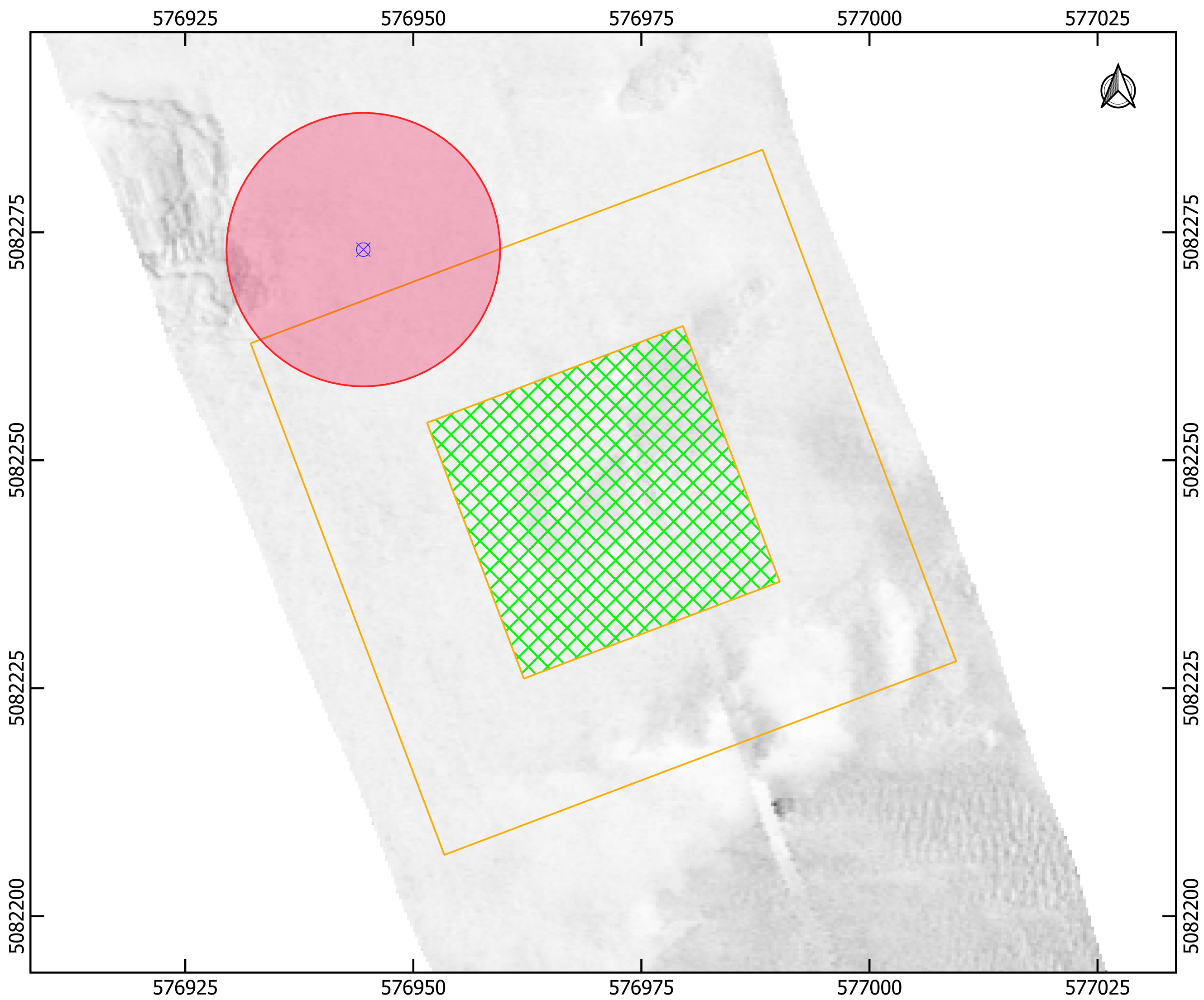
Concession
- AO7- zone Parc
- AO7-zone corridor

AO7_OWF geotechnical
- Original geotechnical boxes
- Validated geotechnical boxes

ALARP
- AO7_OWF_sidescan sonarl targets
- AO7_OWF_Targets_avoidance area
- AO7_OWF ALARP zones
- survey extent







ANNEXE A: AO7_GI02
ALARP CERTIFICATE GIS

Scale: 1/750
Geodesy : WGS 84 - UTM 30N

Date: 2023-06-30
Version: V0

0 10 20 30 40 m

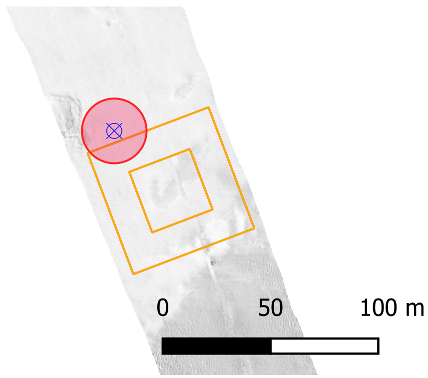
Original Location

x=576970.821,y= 5082245.384

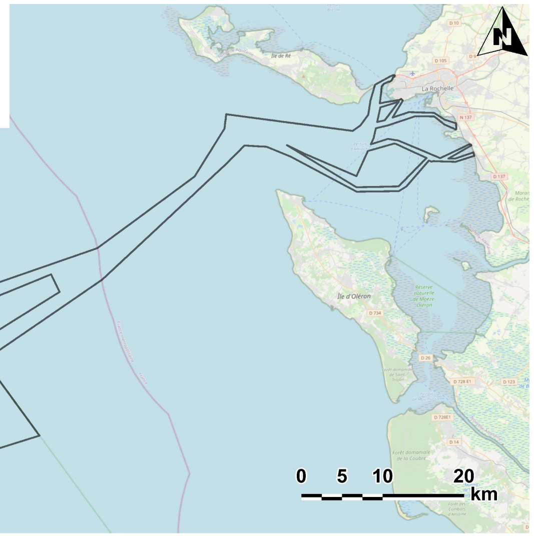
Concession
- AO7- zone Parc
- AO7-zone corridor

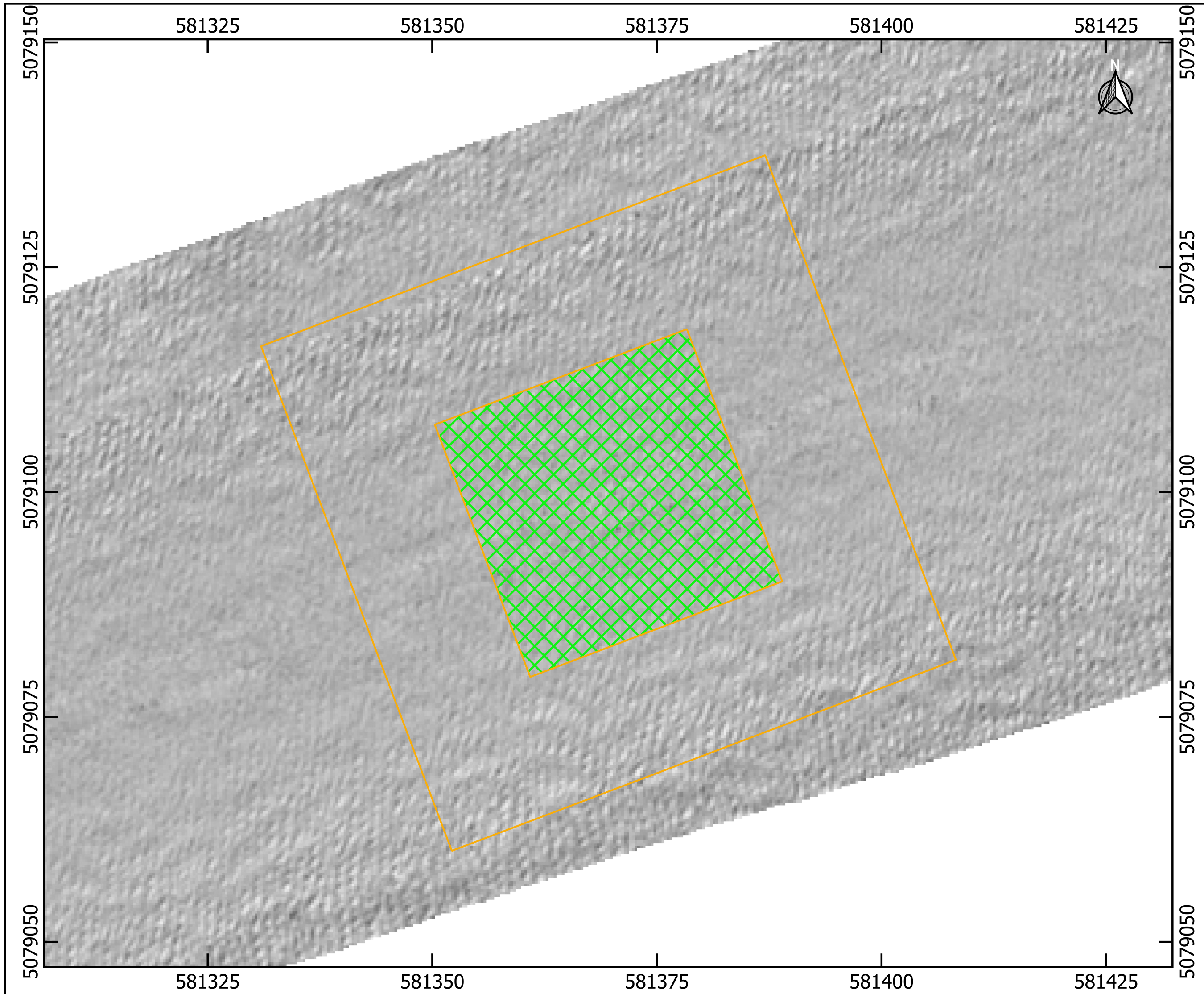
AO7_OWF geotechnical
- Original geotechnical boxes
- Validated geotechnical boxes

ALARP
- AO7_OWF_sidescan sonarl targets
- AO7_OWF_Targets_avoidance area
- AO7_OWF ALARP zones
- survey extent



GEOMINES





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ANNEXE A: AO7_GI03 ALARP CERTIFICATE GIS

Scale: 1/750
Geodesy : WGS 84 - UTM 30N

Date: 2023-06-30
Version: V0

0 10 20 30 40 m

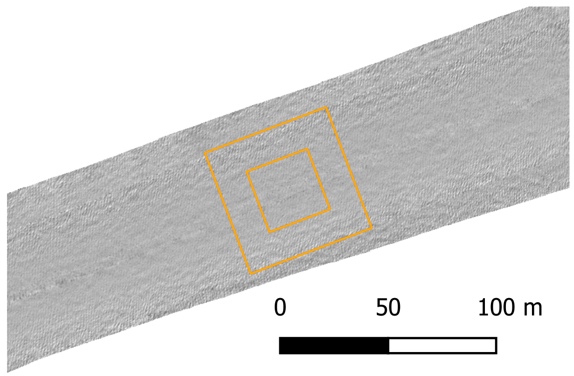
Original Location

x=581369.598,y= 5079098.776

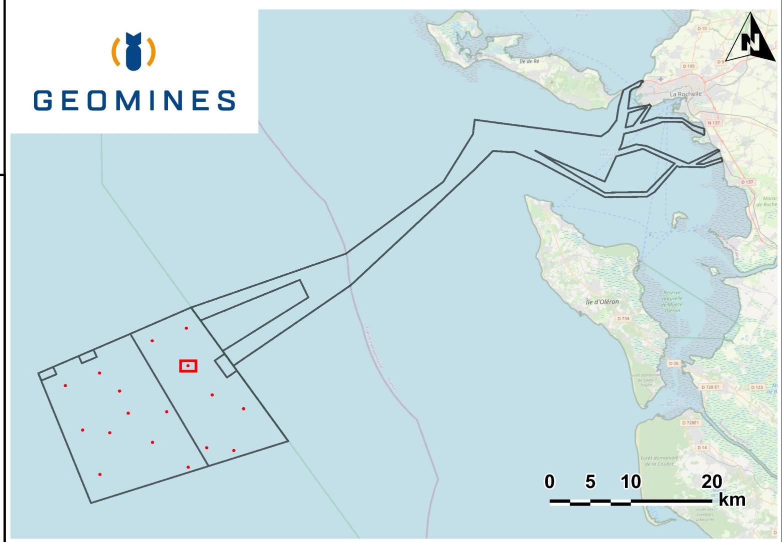
Concession
- AO7- zone Parc
- AO7-zone corridor

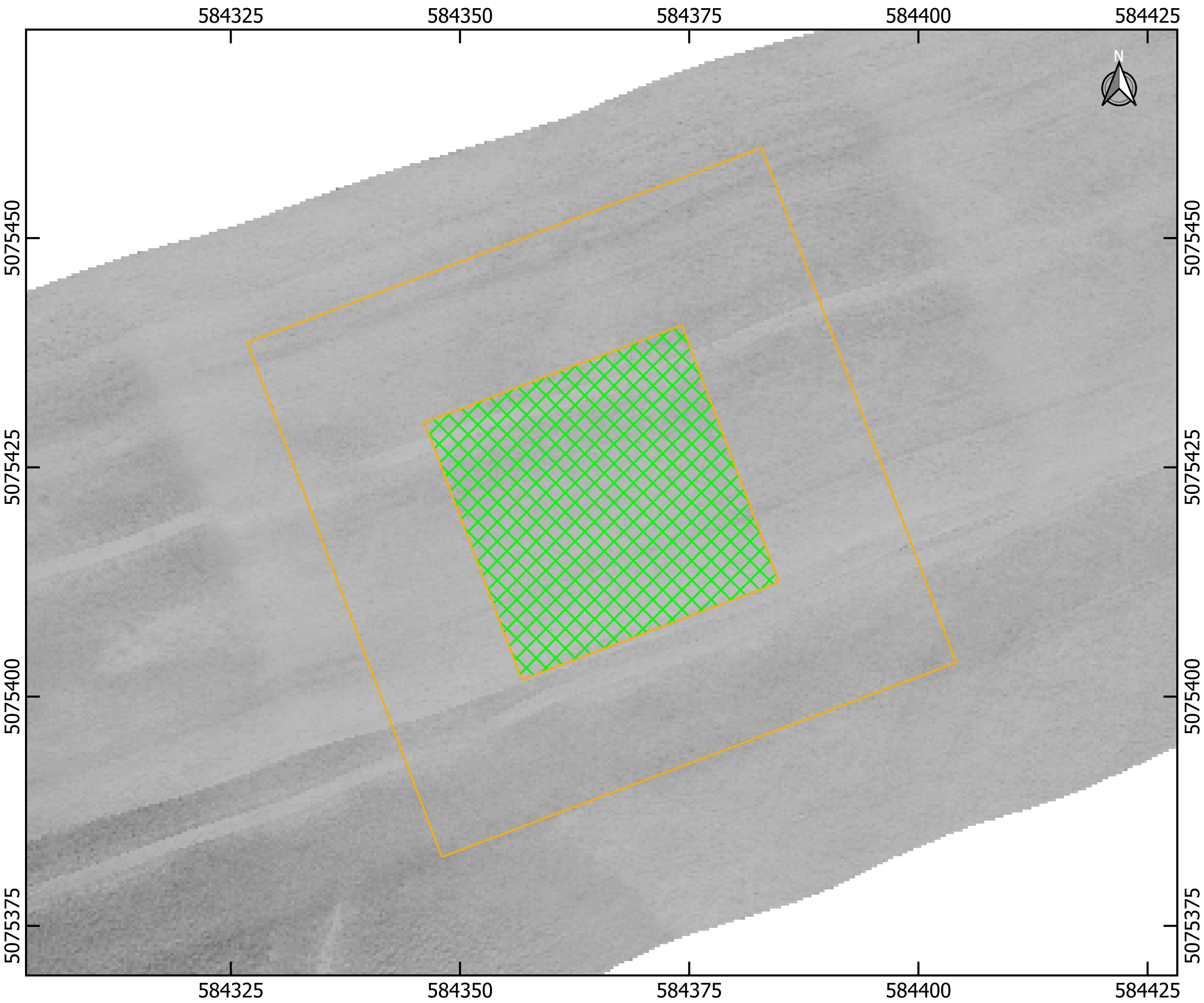
AO7_OWF geotechnical
- Original geotechnical boxes
- Validated geotechnical boxes

ALARP
- AO7_OWF_sidescan sonarl targets
- AO7_OWF_Targets_avoidance area
- AO7_OWF ALARP zones
- survey extent



GEOMINES





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ANNEXE A: AO7_GI04
ALARP CERTIFICATE GIS

Scale: 1/750
Geodesy : WGS 84 - UTM 30N

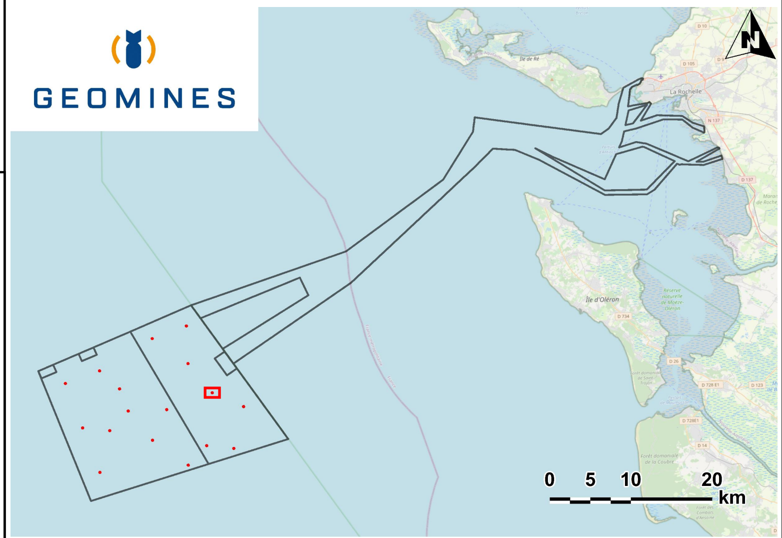
Date: 2023-06-30
Version: V0

0 10 20 30 40 m

Original Location

x=584365.452,y= 5075421.165

GEOMINES



Concession

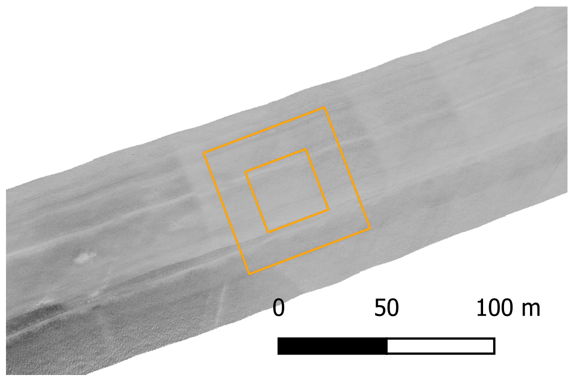
- AO7- zone Parc
- AO7-zone corridor

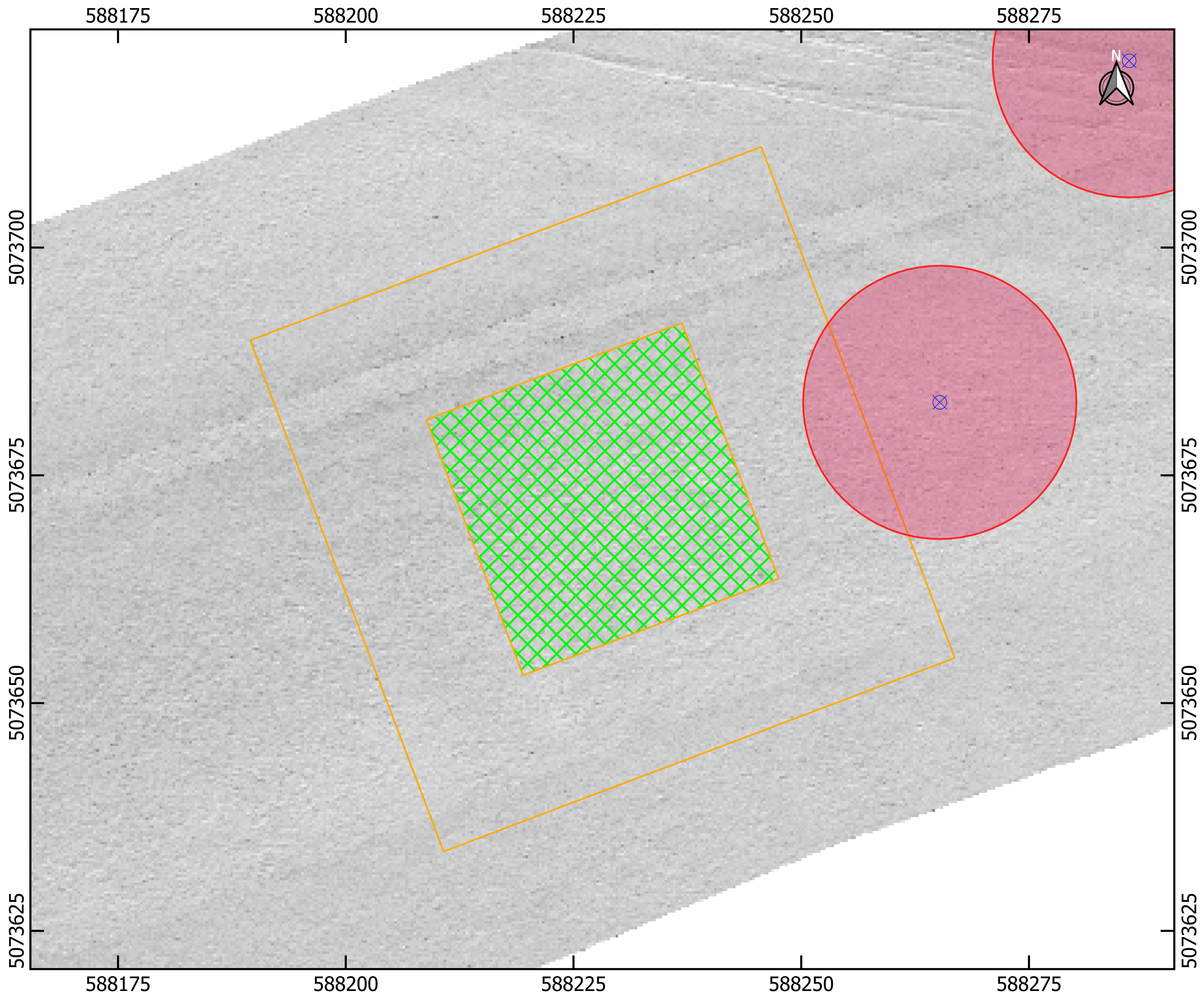
AO7_OWF geotechnical

- Original geotechnical boxes
- Validated geotechnical boxes

ALARP

- AO7_OWF_sidescan sonarl targets
- AO7_OWF_Targets_avoidance area
- AO7_OWF ALARP zones
- survey extent





ANNEXE A: AO7_GI05
ALARP CERTIFICATE GIS

Scale: 1/750
Geodesy : WGS 84 - UTM 30N

Date: 2023-06-30
Version: V0

0 10 20 30 40 m

Alternate Location

x=588228.167,y= 5073672.374

Concession

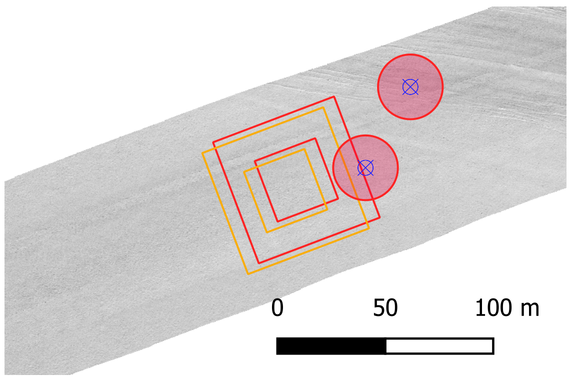
- AO7- zone Parc
- AO7-zone corridor

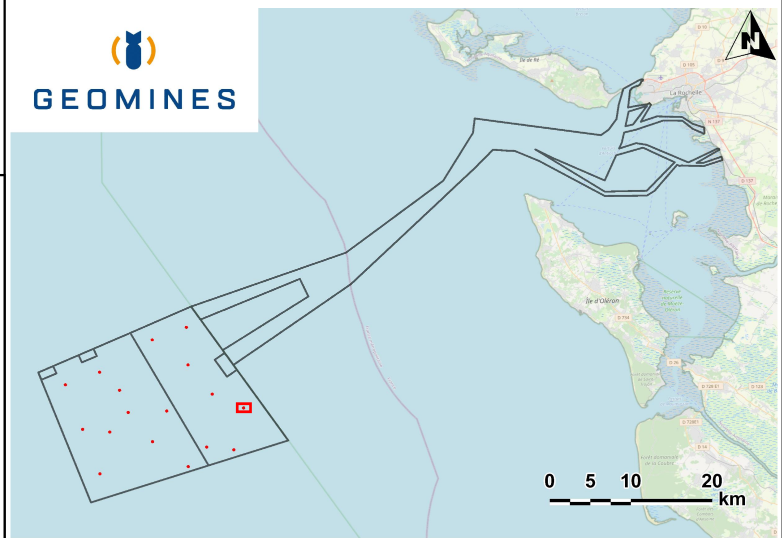
AO7_OWF geotechnical

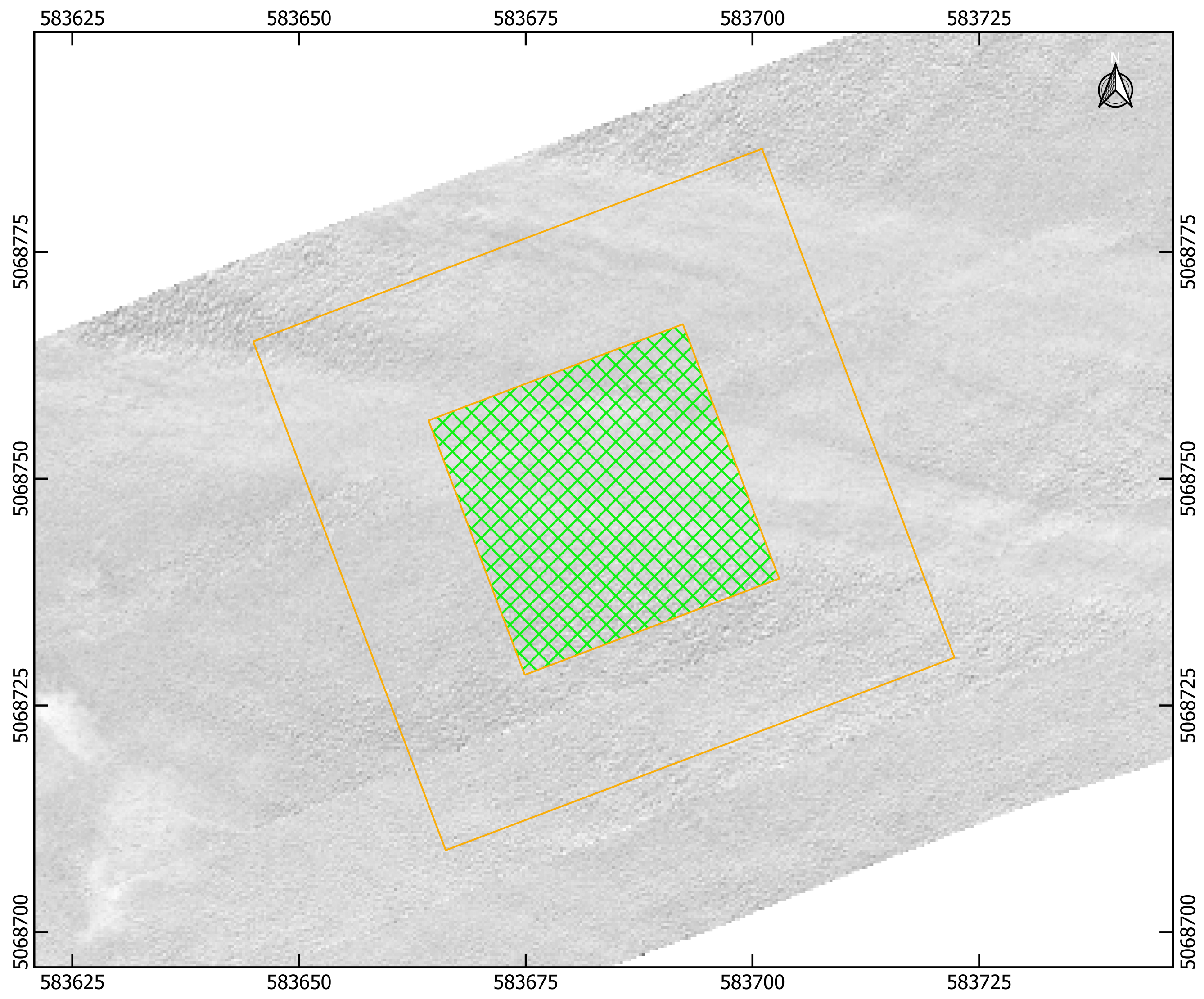
- Original geotechnical boxes
- Validated geotechnical boxes

ALARP

- AO7_OWF_sidescan sonarl targets
- AO7_OWF_Targets_avoidance area
- AO7_OWF ALARP zones
- survey extent







ANNEXE A: AO7_GI06
ALARP CERTIFICATE GIS

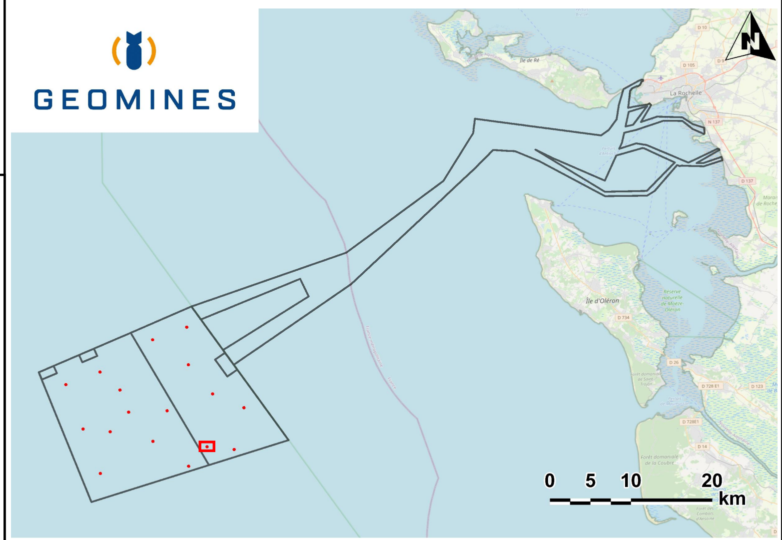
Scale: 1/750
Geodesy : WGS 84 - UTM 30N

Date: 2023-06-30
Version: V0

0 10 20 30 40 m

Original Location

x=583683.596,y= 5068747.695



Concession

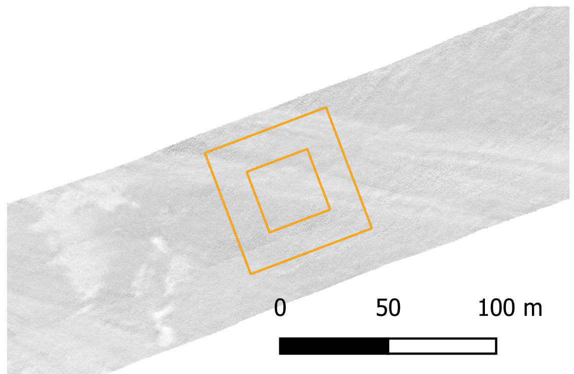
- AO7- zone Parc
- AO7-zone corridor

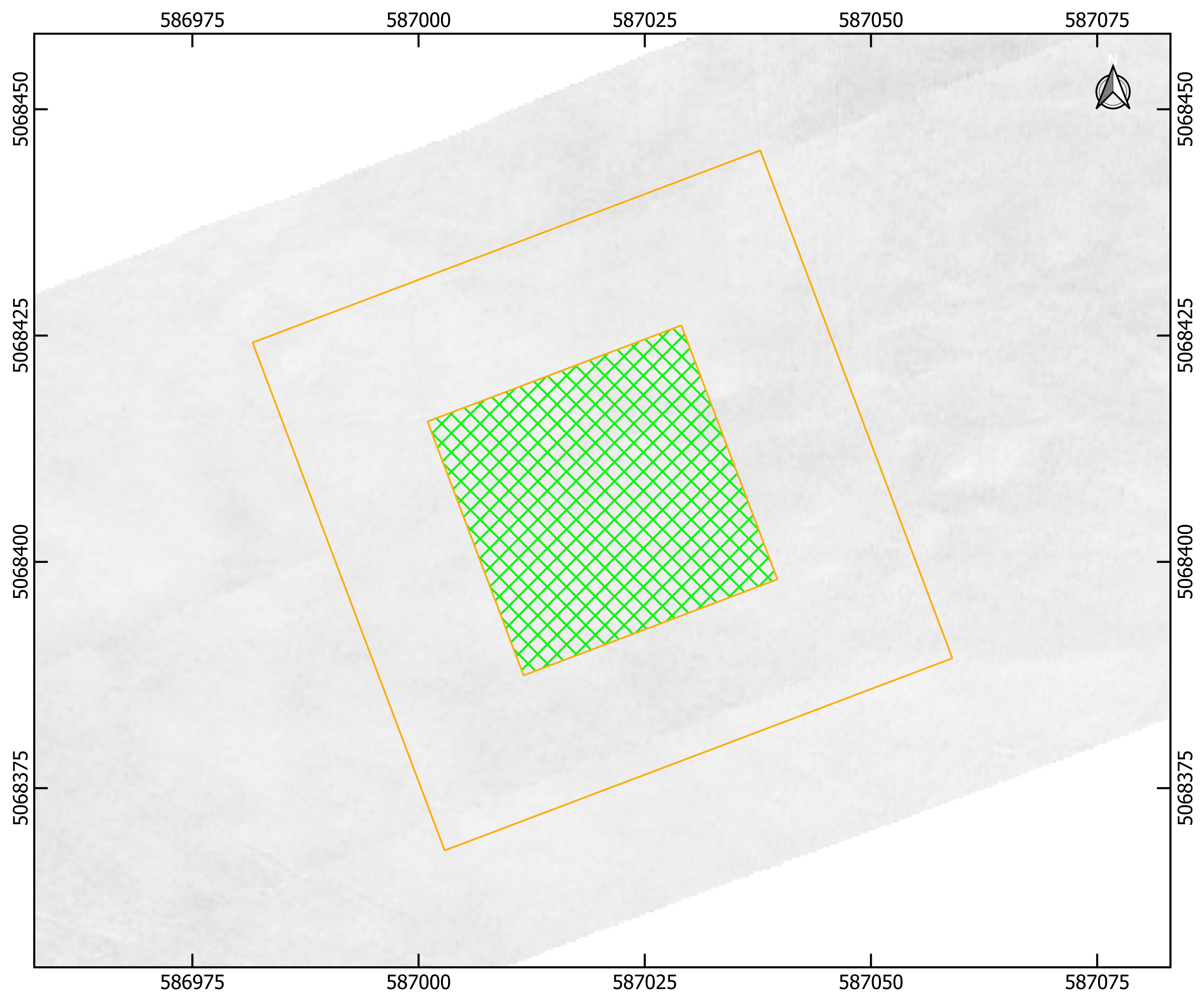
AO7_OWF geotechnical

- Original geotechnical boxes
- Validated geotechnical boxes

ALARP

- AO7_OWF_sidescan sonarl targets
- AO7_OWF_Targets_avoidance area
- AO7_OWF ALARP zones
- survey extent





ANNEXE A: AO7_GI07
ALARP CERTIFICATE GIS

Scale: 1/750
Geodesy : WGS 84 - UTM 30N

Date: 2023-06-30
Version: V0

0 10 20 30 40 m

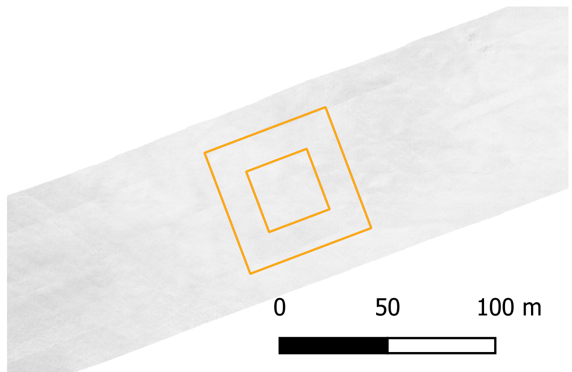
Original Location

x=587020.312,y= 5068406.779

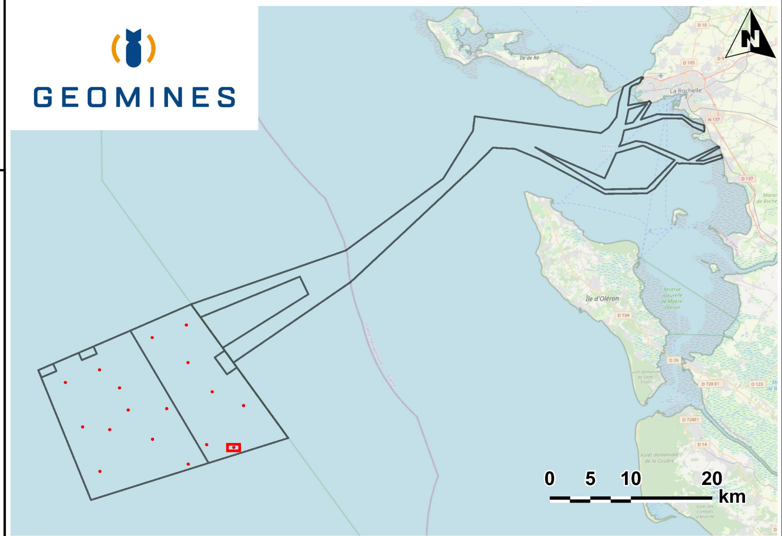
Concession
- AO7- zone Parc
- AO7-zone corridor

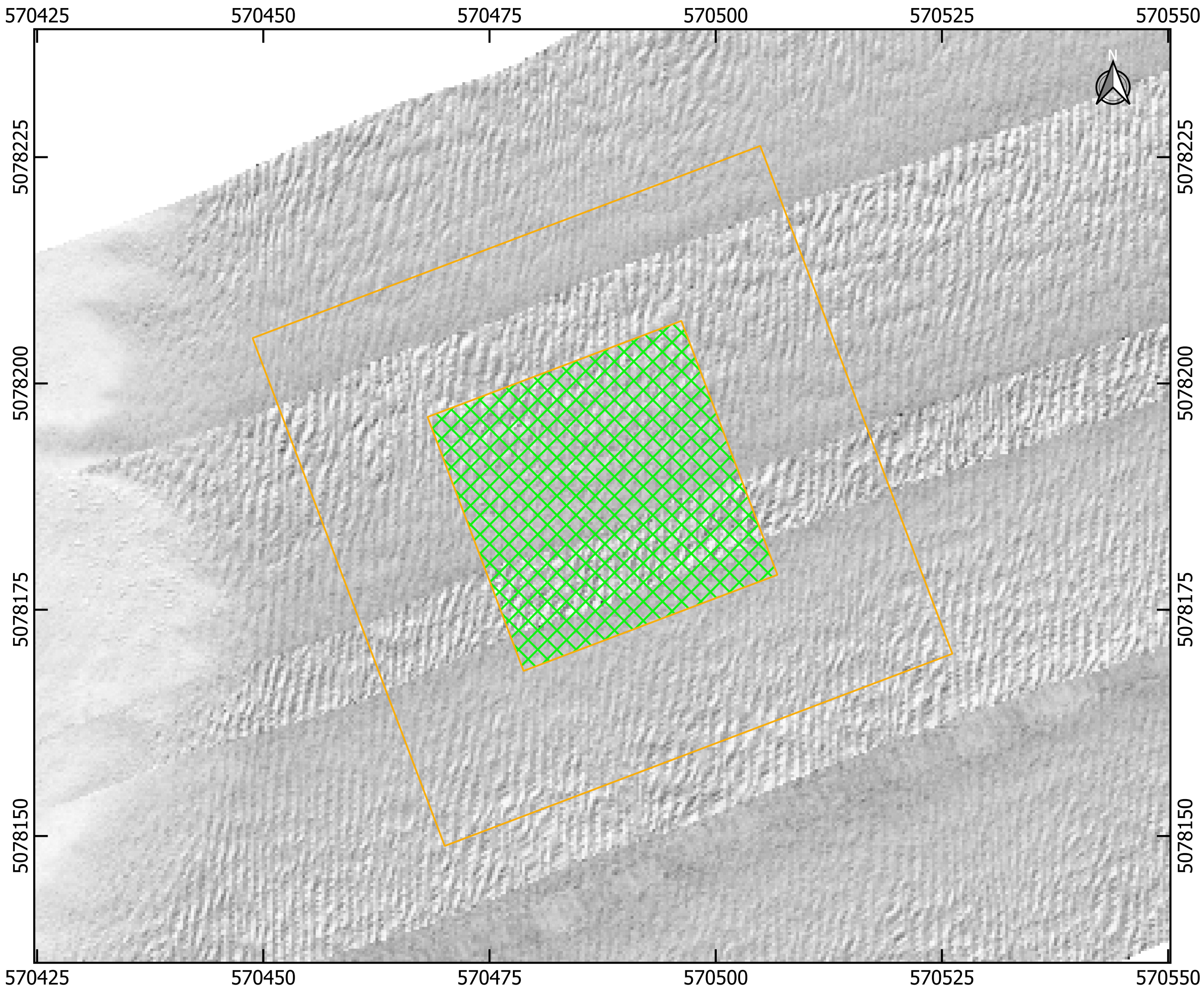
AO7_OWF geotechnical
- Original geotechnical boxes
- Validated geotechnical boxes

ALARP
- AO7_OWF_sidescan sonarl targets
- AO7_OWF_Targets_avoidance area
- AO7_OWF ALARP zones
- survey extent



GEOMINES





ANNEXE A: AO7_GI08
ALARP CERTIFICATE GIS

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Scale: 1/750
Geodesy : WGS 84 - UTM 30N

Date: 2023-06-30
Version: V0

0 10 20 30 40 m

Original Location

x=570487.471,y= 5078187.565

Concession

AO7- zone Parc

AO7-zone corridor

AO7_OWF geotechnical

Original geotechnical boxes

Validated geotechnical boxes

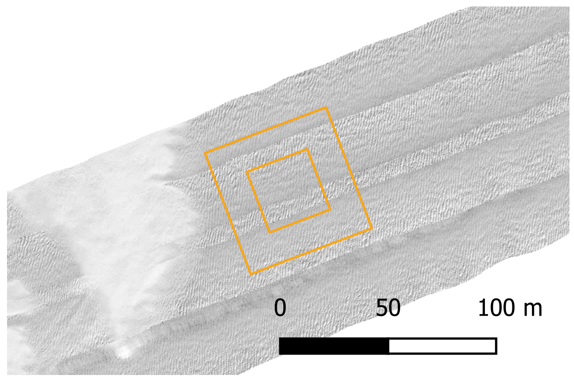
ALARP

AO7_OWF_sidescan sonarl targets

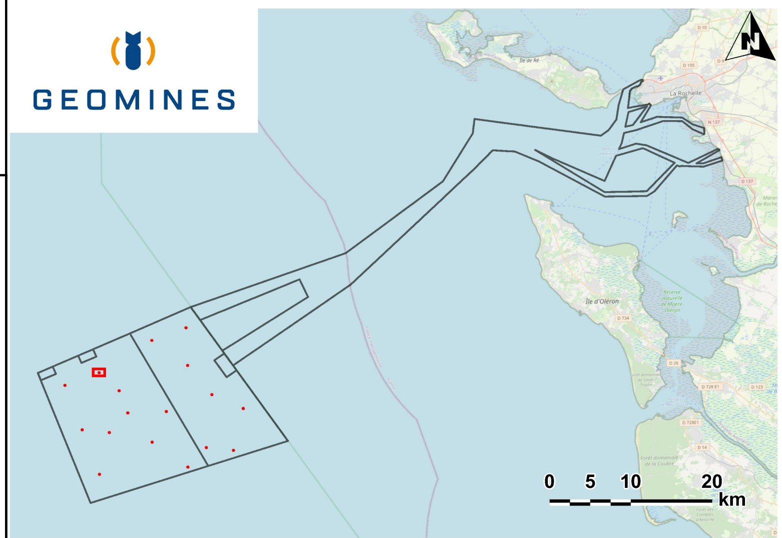
AO7_OWF_Targets_avoidance area

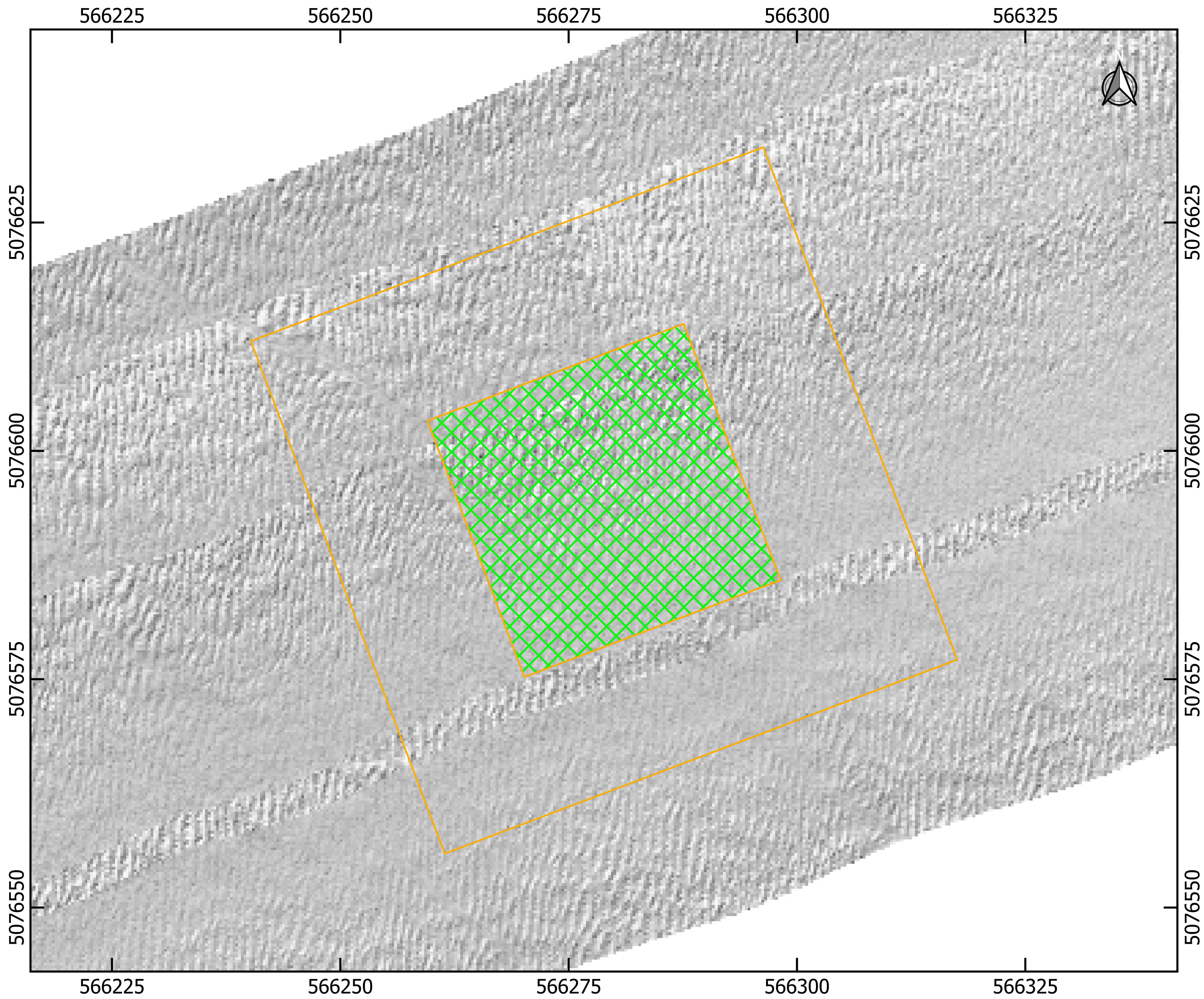
AO7_OWF ALARP zones

survey extent



GEOMINES





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MINISTÈRE
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ANNEXE A: AO7_GI09
ALARP CERTIFICATE GIS

Scale: 1/750
Geodesy : WGS 84 - UTM 30N

Date: 2023-06-30
Version: V0

0 10 20 30 40 m

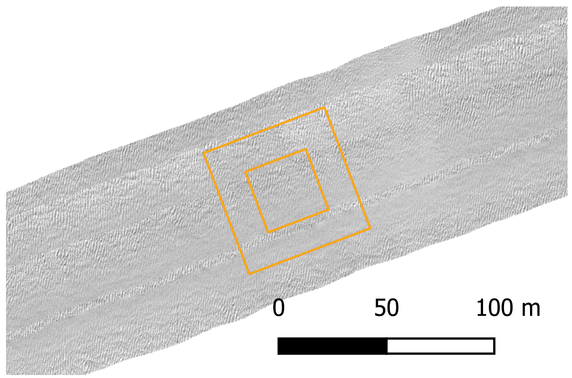
Original Location

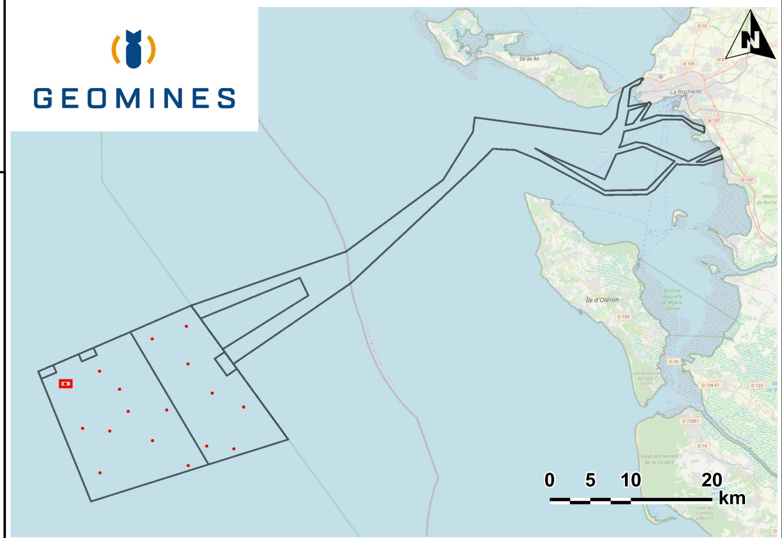
x=566278.864,y= 5076594.564

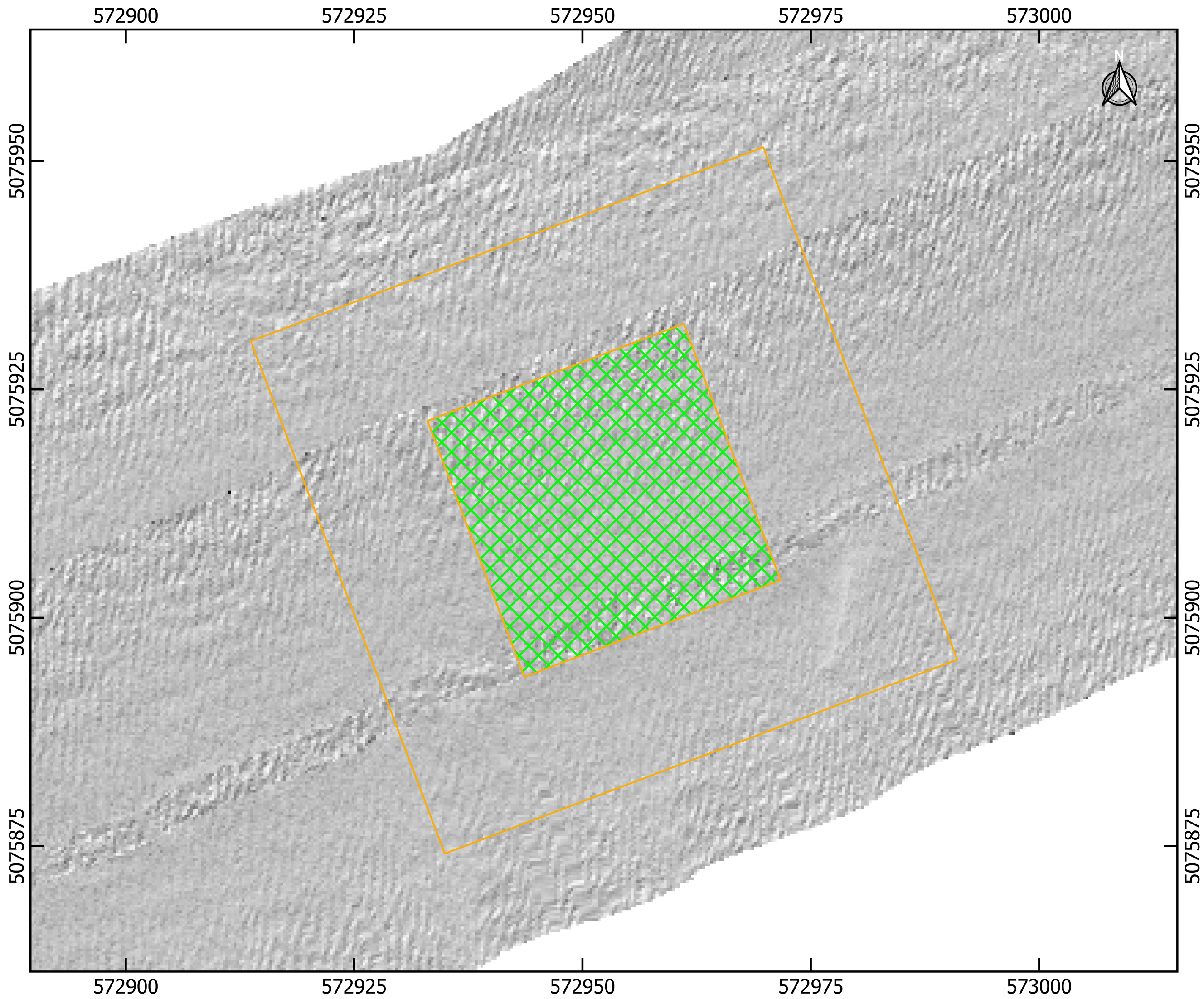
Concession
- AO7- zone Parc
- AO7-zone corridor

AO7_OWF geotechnical
- Original geotechnical boxes
- Validated geotechnical boxes

ALARP
- AO7_OWF_sidescan sonarl targets
- AO7_OWF_Targets_avoidance area
- AO7_OWF ALARP zones
- survey extent







ANNEXE A: AO7_GI10
ALARP CERTIFICATE GIS

Scale: 1/750
Geodesy : WGS 84 - UTM 30N

Date: 2023-06-30
Version: V0

0 10 20 30 40 m

Original Location

x=572952.35,y= 5075912.838

Concession

AO7- zone Parc

AO7-zone corridor

AO7_OWF geotechnical

Original geotechnical boxes

Validated geotechnical boxes

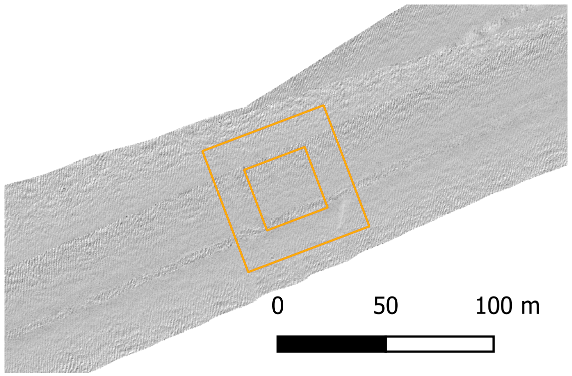
ALARP

AO7_OWF_sidescan sonarl targets

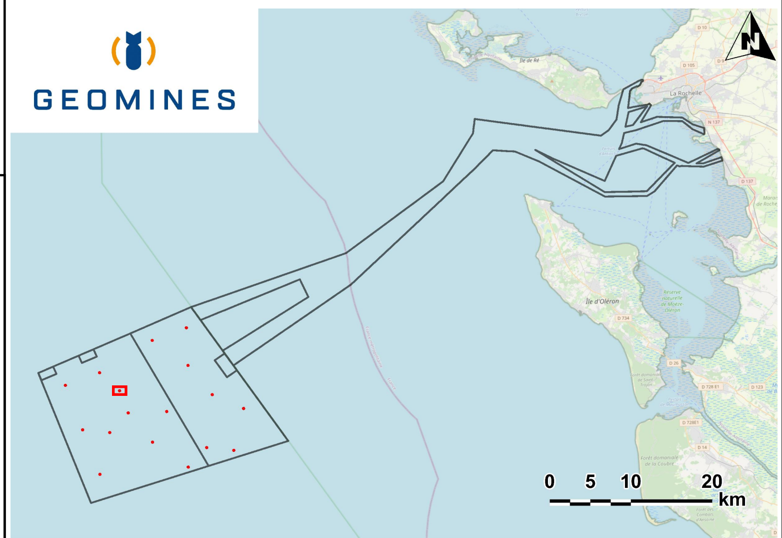
AO7_OWF_Targets_avoidance area

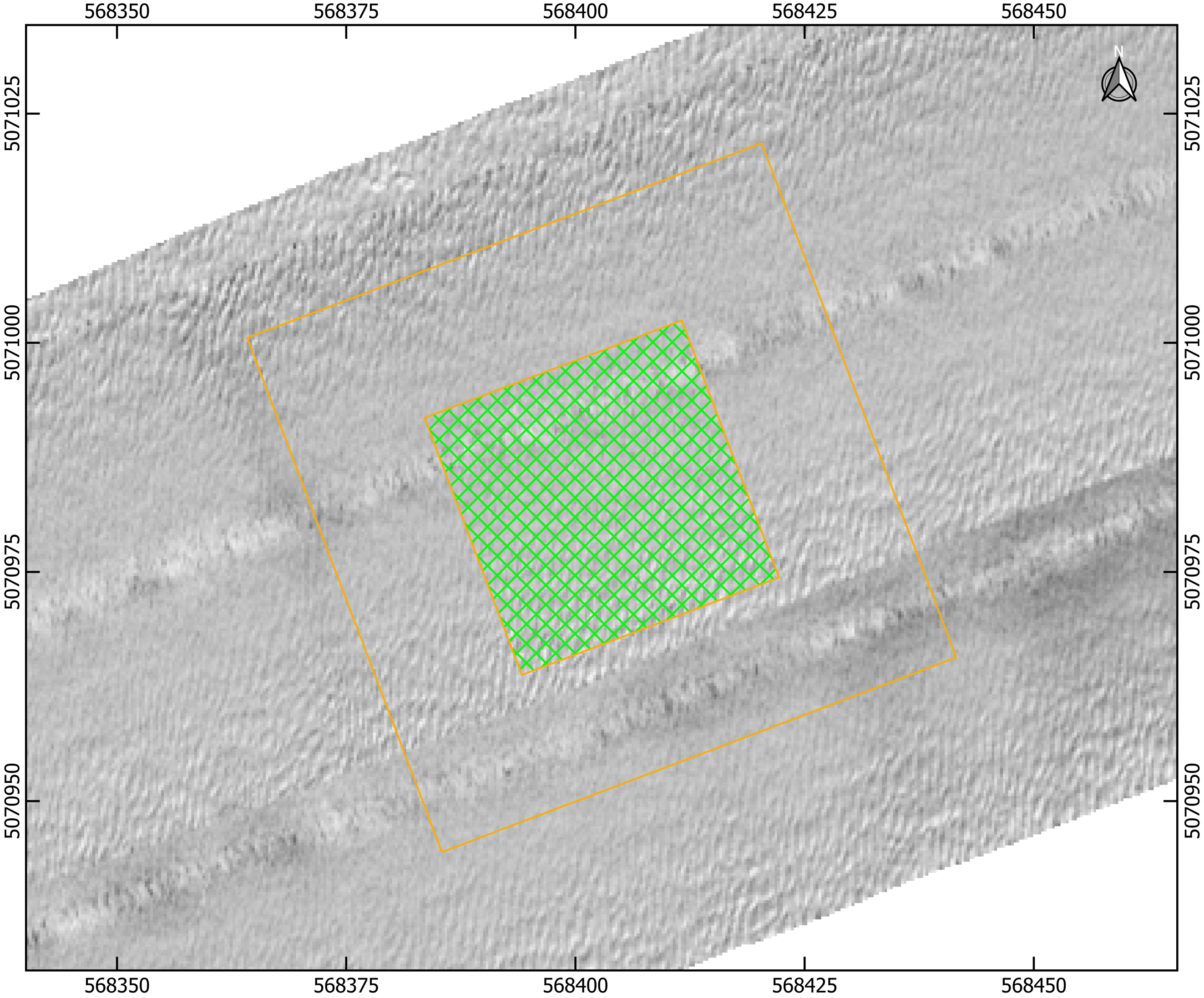
AO7_OWF ALARP zones

survey extent



GEOMINES





ANNEXE A: AO7_GI11
ALARP CERTIFICATE GIS

Scale: 1/750
Geodesy : WGS 84 - UTM 30N

Date: 2023-06-30
Version: V0

0 10 20 30 40 m

Original Location

x=568402.865,y= 5070983.096

Concession

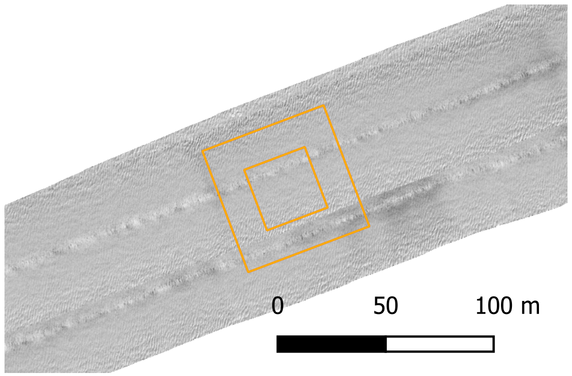
- AO7- zone Parc
- AO7-zone corridor

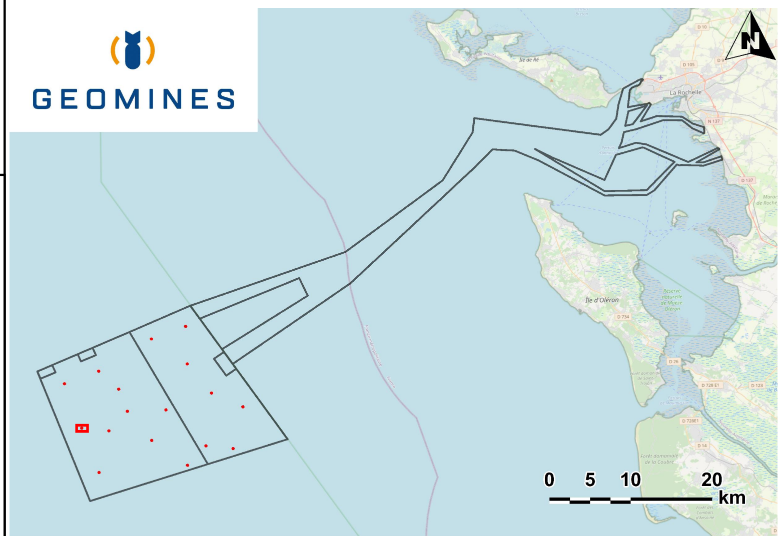
AO7_OWF geotechnical

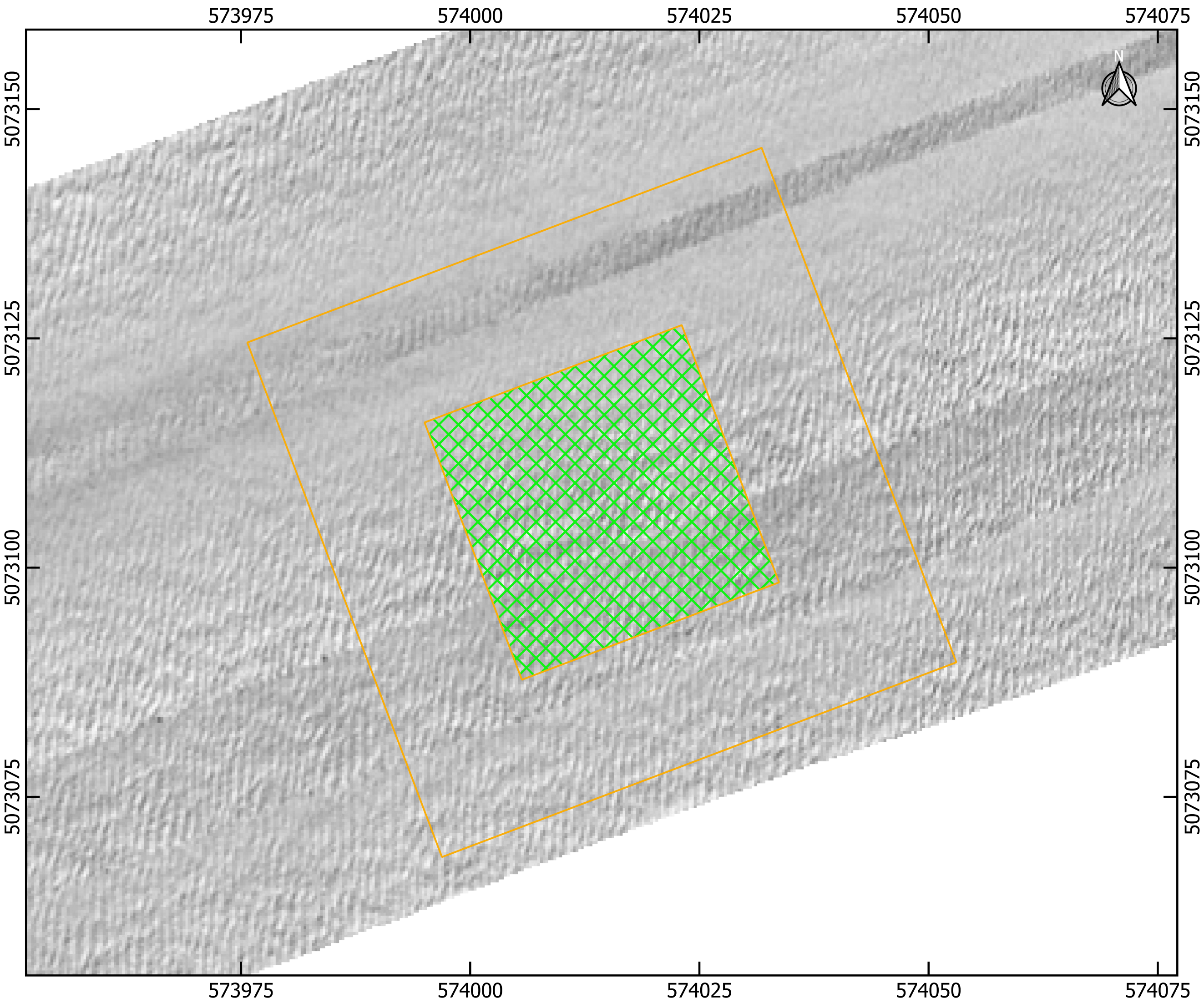
- Original geotechnical boxes
- Validated geotechnical boxes

ALARP

- AO7_OWF_sidescan sonarl targets
- AO7_OWF_Targets_avoidance area
- AO7_OWF ALARP zones
- survey extent







ANNEXE A: AO7_GI13
ALARP CERTIFICATE GIS

Scale: 1/750
Geodesy : WGS 84 - UTM 30N

Date: 2023-06-30
Version: V0

0 10 20 30 40 m

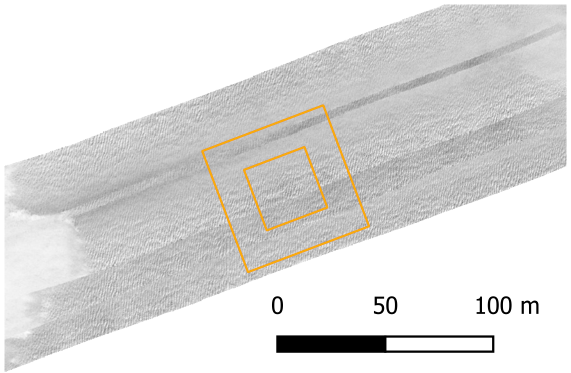
Original Location

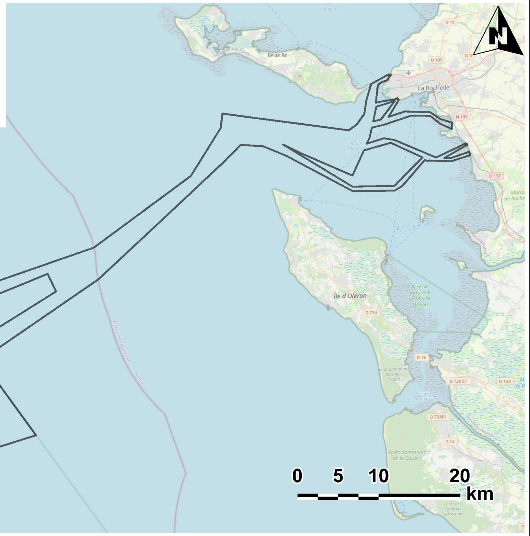
x=574014.341,y= 5073107.102

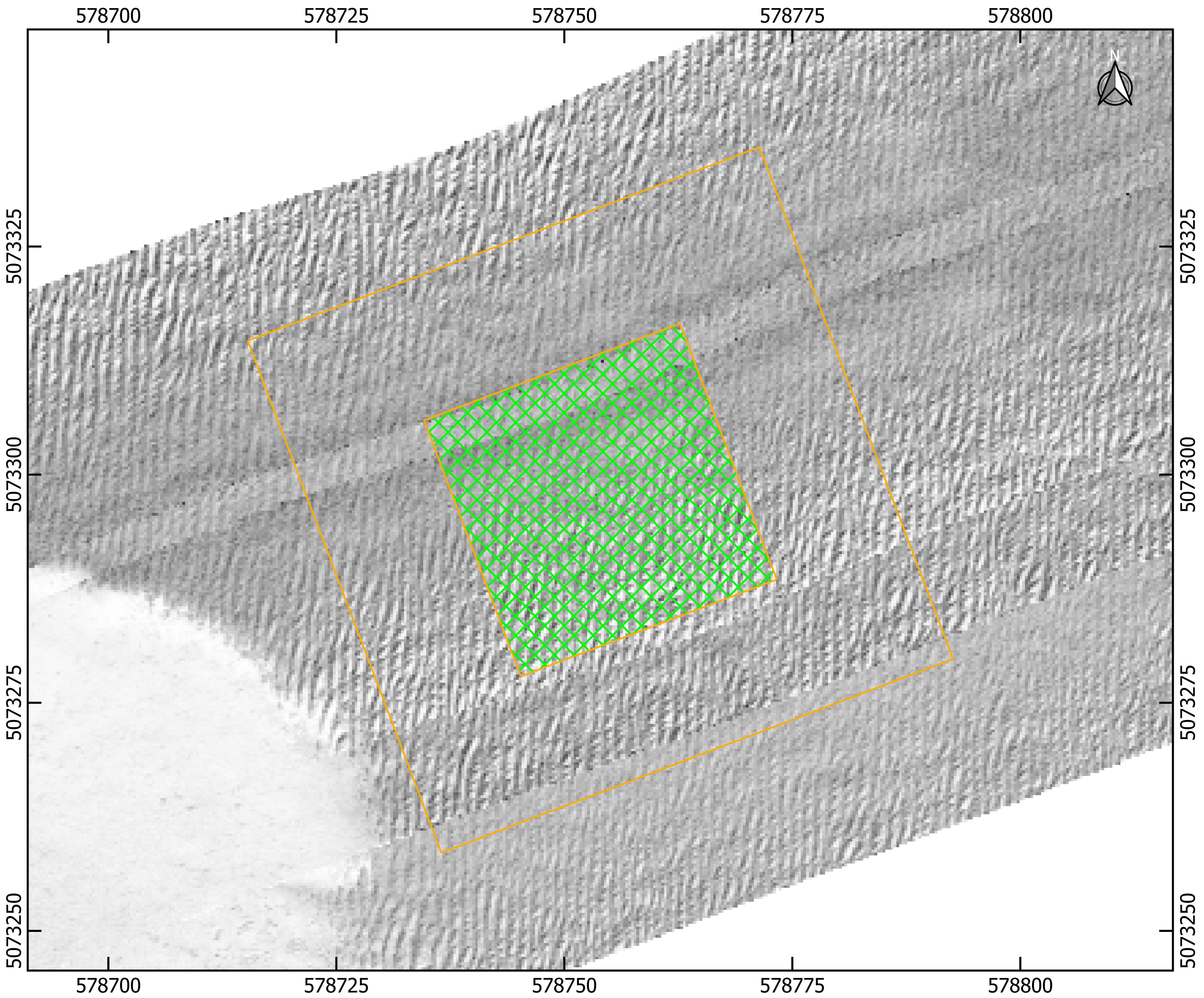
Concession
- AO7- zone Parc
- AO7-zone corridor

AO7_OWF geotechnical
- Original geotechnical boxes
- Validated geotechnical boxes

ALARP
- AO7_OWF_sidescan sonarl targets
- AO7_OWF_Targets_avoidance area
- AO7_OWF ALARP zones
- survey extent







ANNEXE A: AO7_GI14
ALARP CERTIFICATE GIS

Scale: 1/750
Geodesy : WGS 84 - UTM 30N

Date: 2023-06-30
Version: V0

0 10 20 30 40 m

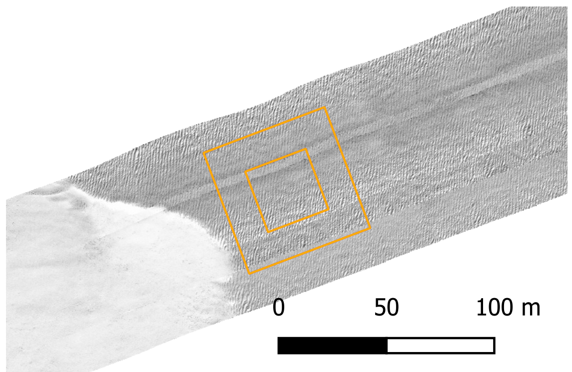
OriginalL Location

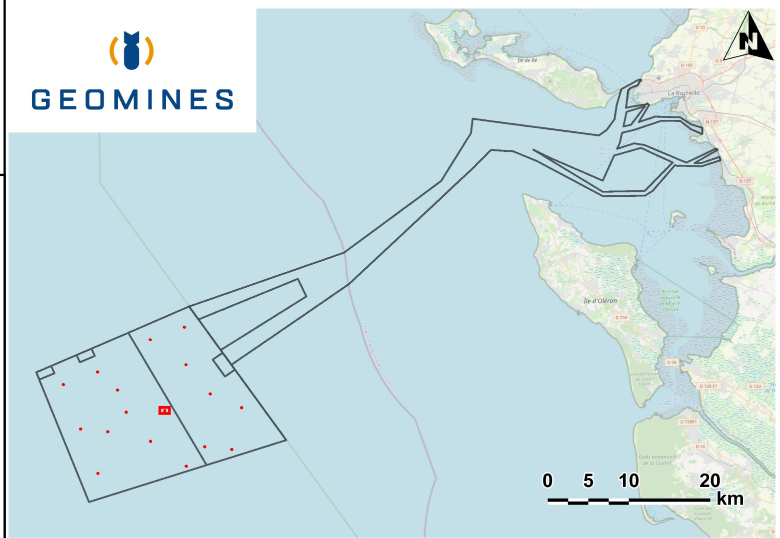
x=578753.945,y= 5073297.22

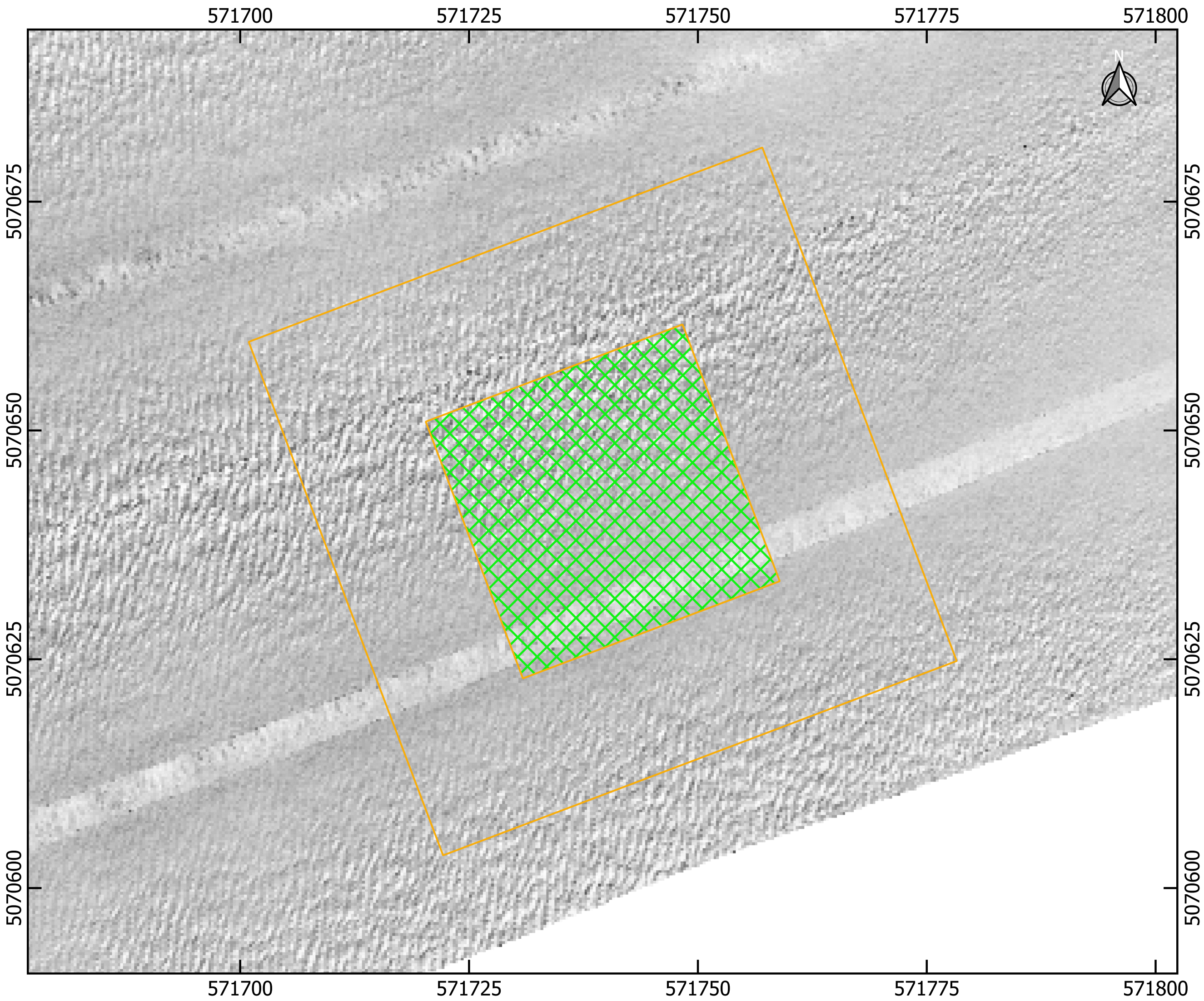
Concession
- AO7- zone Parc
- AO7-zone corridor

AO7_OWF geotechnical
- Original geotechnical boxes
- Validated geotechnical boxes

ALARP
- AO7_OWF_sidescan sonarl targets
- AO7_OWF_Targets_avoidance area
- AO7_OWF ALARP zones
- survey extent







ANNEXE A: AO7_GI15
ALARP CERTIFICATE GIS

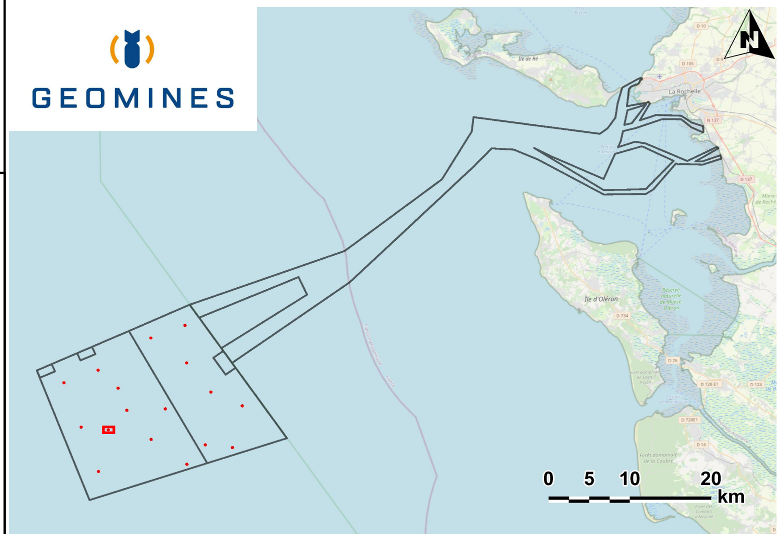
Scale: 1/750
Geodesy : WGS 84 - UTM 30N

Date: 2023-06-30
Version: V0

0 10 20 30 40 m

Original Location

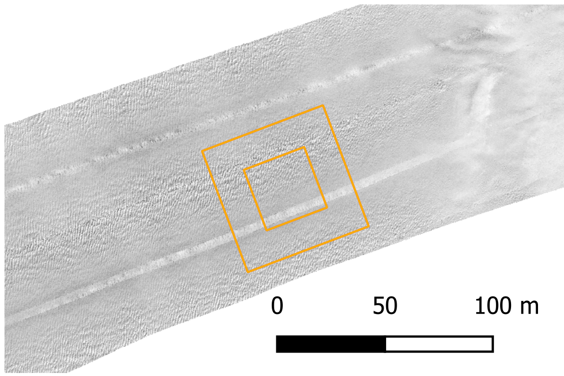
x=571739.587,y= 5070642.236

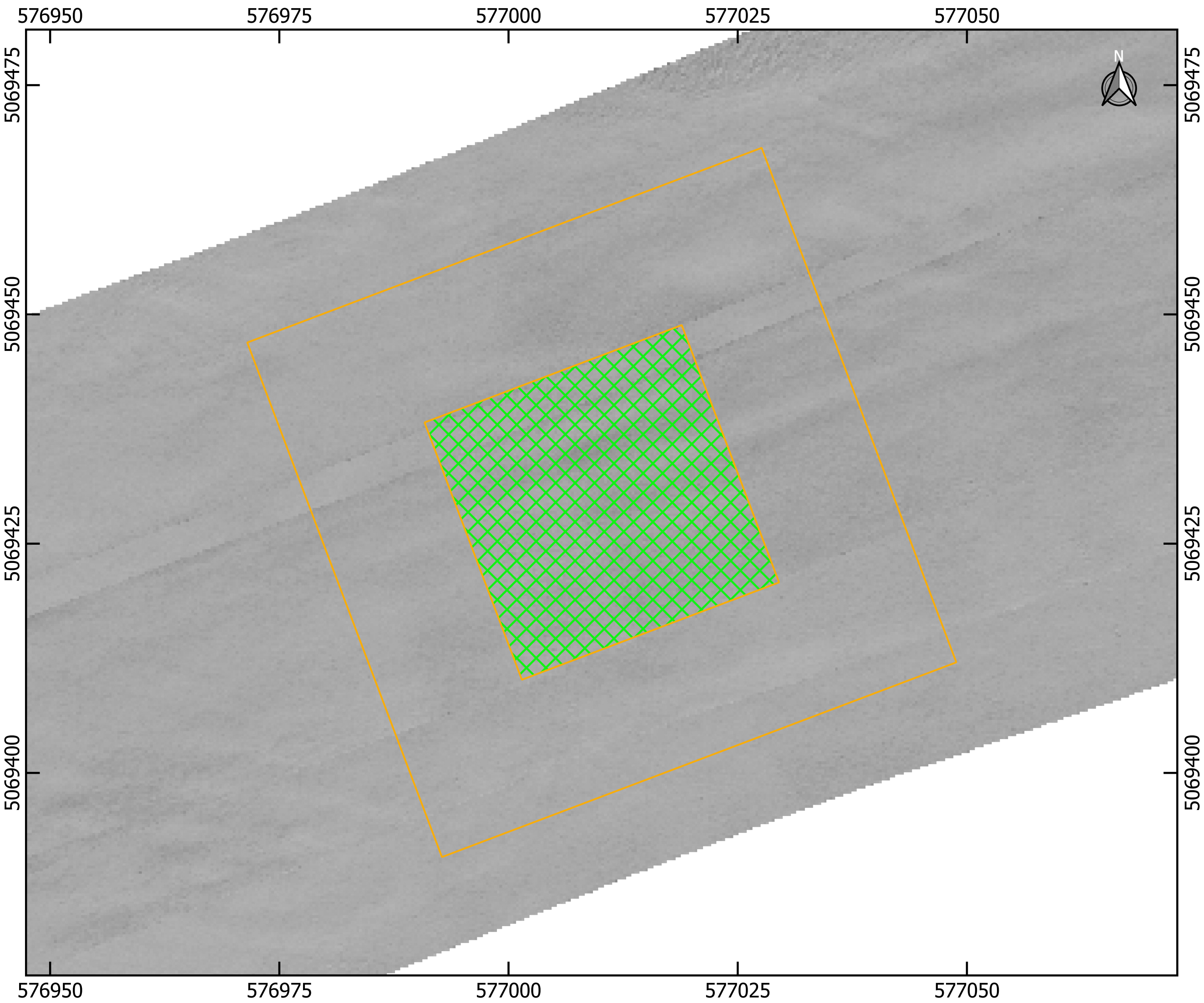


Concession
- AO7- zone Parc
- AO7-zone corridor

AO7_OWF geotechnical
- Original geotechnical boxes
- Validated geotechnical boxes

ALARP
- AO7_OWF_sidescan sonarl targets
- AO7_OWF_Targets_avoidance area
- AO7_OWF ALARP zones
- survey extent





ANNEXE A: AO7_GI16
ALARP CERTIFICATE GIS

Scale: 1/750
Geodesy : WGS 84 - UTM 30N

Date: 2023-06-30
Version: V0

0 10 20 30 40 m

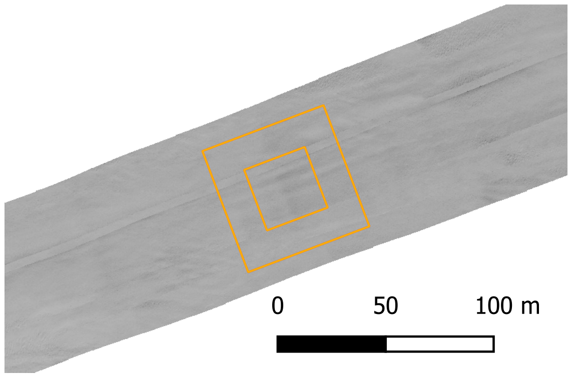
Original Location

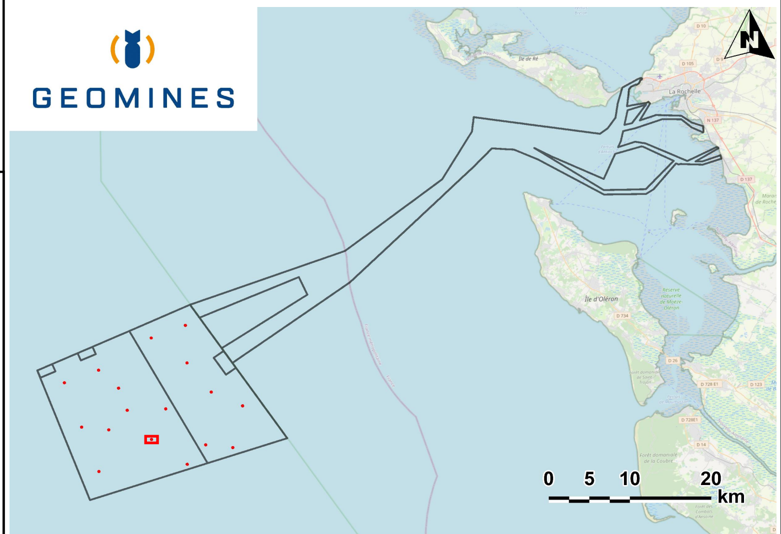
x=577010.16,y= 5069429.487

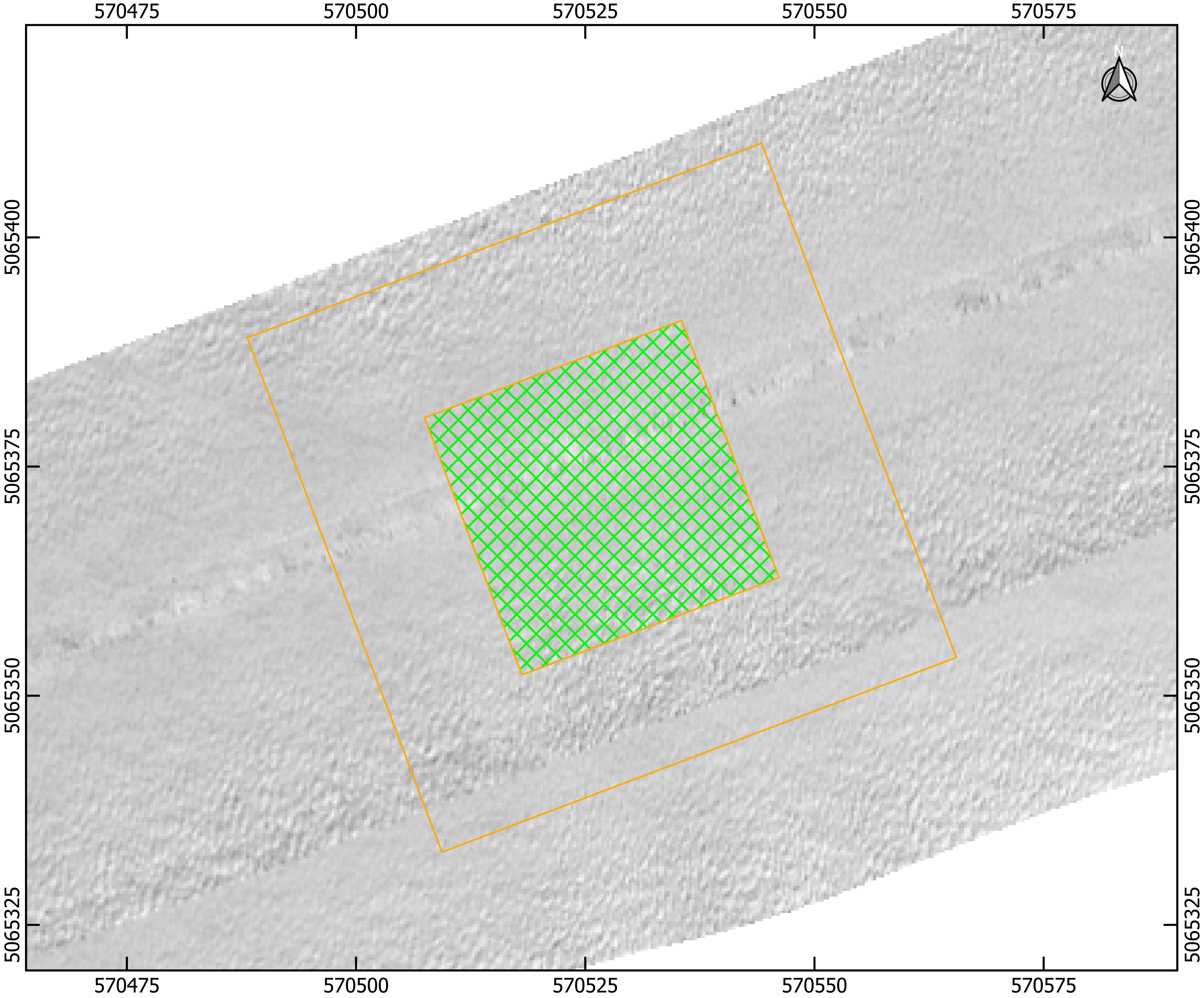
Concession
- AO7- zone Parc
- AO7-zone corridor

AO7_OWF geotechnical
- Original geotechnical boxes
- Validated geotechnical boxes

ALARP
- AO7_OWF_sidescan sonarl targets
- AO7_OWF_Targets_avoidance area
- AO7_OWF ALARP zones
- survey extent







ANNEXE A: AO7_GI17
ALARP CERTIFICATE GIS

Scale: 1/750
Geodesy : WGS 84 - UTM 30N

Date: 2023-06-30
Version: V0

0 10 20 30 40 m

Original Location

x=570526.789,y= 5065371.599

Concession

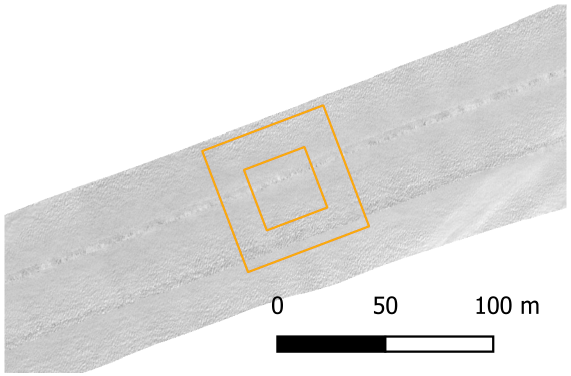
- AO7- zone Parc
- AO7-zone corridor

AO7_OWF geotechnical

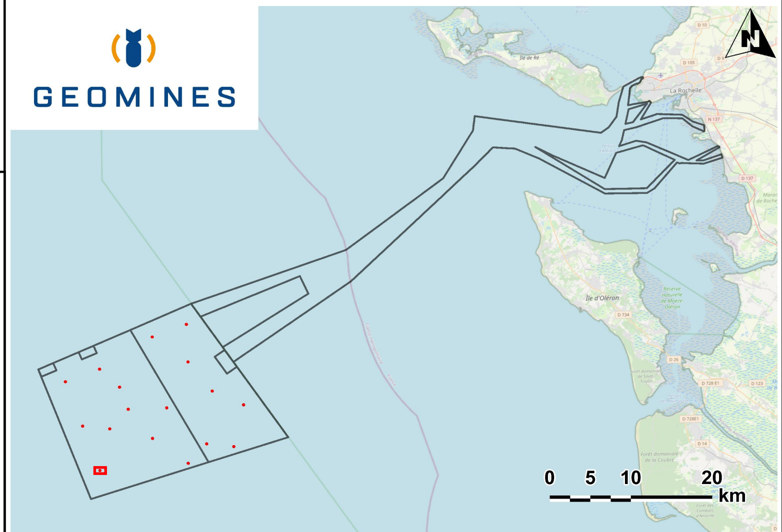
- Original geotechnical boxes
- Validated geotechnical boxes

ALARP

- AO7_OWF_sidescan sonarl targets
- AO7_OWF_Targets_avoidance area
- AO7_OWF ALARP zones
- survey extent



GEOMINES



TECNOAMBIENTE
A TRADEBE COMPANY

MINISTÈRE
DE LA TRANSITION
ÉCOLOGIQUE

FUGRO

ANNEXE A: AO7_GI18
ALARP CERTIFICATE GIS

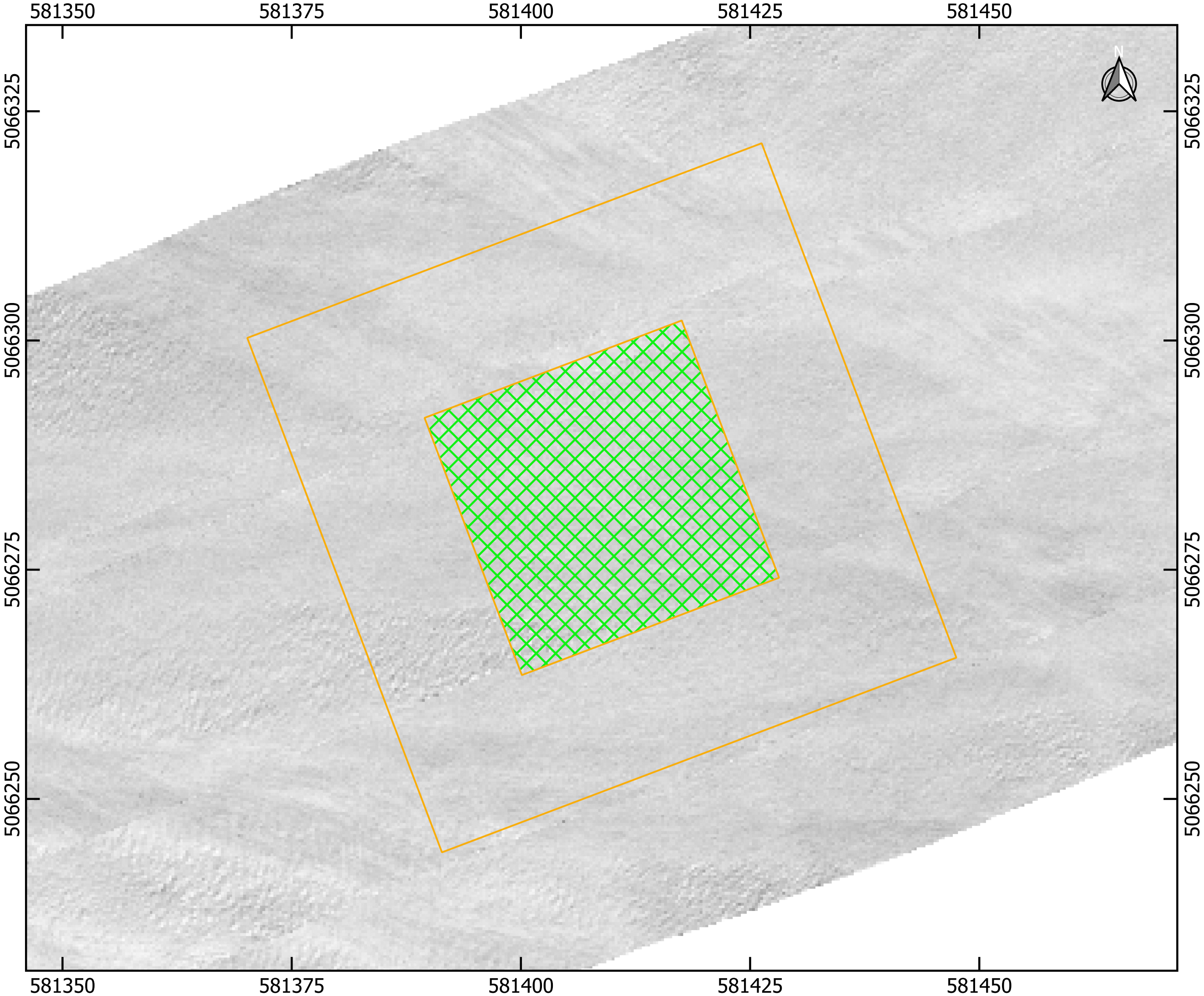
Scale: 1/750
Geodesy : WGS 84 - UTM 30N

Date: 2023-06-30
Version: V0

0 10 20 30 40 m

Original Location

x=581408.809,y= 5066282.835



Concession

AO7- zone Parc

AO7-zone corridor

AO7_OWF geotechnical

Original geotechnical boxes

Validated geotechnical boxes

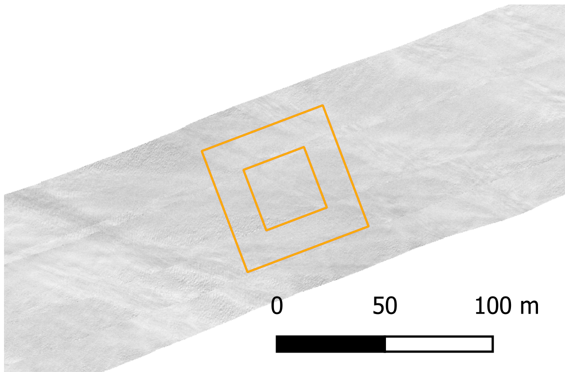
ALARP

AO7_OWF_sidescan sonarl targets

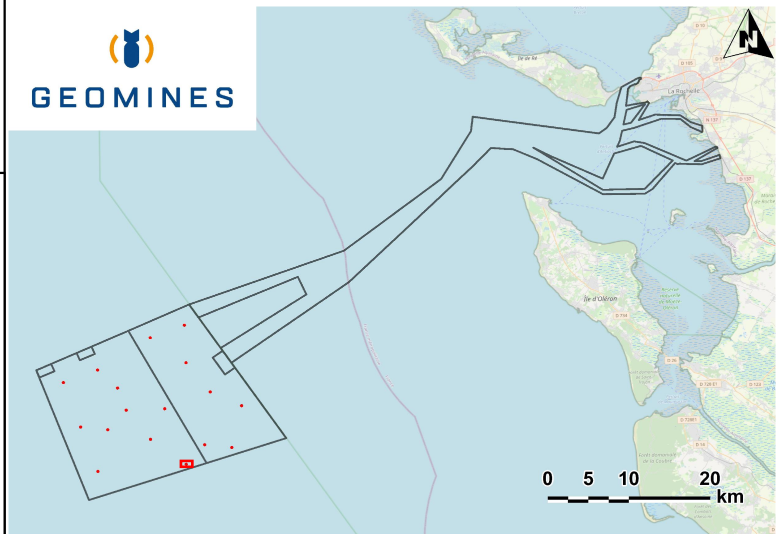
AO7_OWF_Targets_avoidance area

AO7_OWF ALARP zones

survey extent



GEOMINES



APPENDIX II – TARGET LIST

LIST OF SSS TARGETS DETECTED

Target name	WGS84 UTM Zone 30N		Target dimensions			Range (m)	Alt (m)	Head-ing (º)
	X	Y	Height (m)	Length (m)	Width (m)			
AO7_OWF_GI01_1	581213.0	5083833.3	0.9	1.6	1.1	14.6	3.4	316.1
AO7_OWF_GI01_2	581205.2	5083750.0	0.4	1.6	1.1	19.4	3.6	315.3
AO7_OWF_GI01_3	581371.5	5083425.8	0.5	2.9	0.9	18.5	5.6	313.7
AO7_OWF_GI01_4	581339.7	5083498.6	0.2	0.9	0.7	28.7	5.4	185.0
AO7_OWF_GI01_5	581286.4	5083514.2	0.2	0.6	0.6	20.5	5.4	186.1
AO7_OWF_GI01_6	581189.8	5083785.4	0.5	0.9	0.3	15.8	5.7	189.6
AO7_OWF_GI01_7	581175.0	5083799.3	0.3	1.9	1.4	25.8	5.5	189.5
AO7_OWF_GI01_8	581147.2	5083891.1	0.1	0.9	0.6	21.9	4.7	189.1
AO7_OWF_GI01_9	581144.0	5083918.5	0.1	0.6	0.4	14.7	4.5	189.7
AO7_OWF_GI01_10	581209.0	5083757.2	0.5	0.6	1.4	23.6	3.9	186.0
AO7_OWF_GI01_11	581121.9	5083884.4	0.3	2.0	0.3	17.0	3.4	187.6
AO7_OWF_GI01_12	581122.2	5083983.1	0.2	2.3	1.2	27.3	4.2	188.0
AO7_OWF_GI01_13	581001.5	5084285.3	0.4	2.9	0.7	22.6	5.3	188.2
AO7_OWF_GI02_1	576896.0	5082445.9	0.9	2.5	0.4	12.6	4.6	184.8
AO7_OWF_GI02_2	576944.5	5082273.1	0.2	3.0	0.8	25.0	3.4	314.5
AO7_OWF_GI02_3	576922.2	5082457.5	0.5	2.0	2.5	11.9	3.5	316.1
AO7_OWF_GI04_1	581988.8	5079384.4	0.3	0.0	0.0	26.0	4.8	83.5
AO7_OWF_GI04_2	584208.1	5075392.1	0.0	1.0	0.9	27.0	5.7	244.2
AO7_OWF_GI04_3	584588.3	5075551.7	0.3	5.8	1.1	25.8	5.3	82.4
AO7_OWF_GI05_1	588286.0	5073720.5	0.3	2.1	1.1	20.5	4.3	79.5
AO7_OWF_GI05-2	588265.2	5073683.0	0.1	0.6	0.2	8.8	3.2	81.9
AO7_OWF_GI06_1	583476.7	5068692.1	0.1	1.4	0.7	27.7	4.8	76.1
AO7_OWF_GI06_2	583299.7	5068625.5	0.2	1.4	0.9	27.4	5.7	76.6
AO7_OWF_GI06_3	583535.6	5068677.1	0.2	1.8	1.2	27.3	4.5	247.9
AO7_OWF_GI07-1	587169.5	5068417.0	0.0	1.0	0.0	28.9	5.6	84.1
AO7_OWF_GI07-2	587287.2	5068533.7	0.0	0.0	0.0	24.1	5.3	248.5
AO7_OWF_GI07-3	586865.4	5068374.6	0.3	1.0	1.7	26.9	5.3	251.7
AO7_OWF_GI14_1	579067.1	5073398.3	0.0	0.0	0.0	5.5	4.0	82.2
AO7_OWF_GI14_2	579031.5	5073396.7	0.5	0.9	0.5	10.5	4.4	84.0
AO7_OWF_GI16_1	576736.1	5069309.1	0.0	0.0	0.0	29.3	4.2	79.6
AO7_OWF_GI16_2	577303.2	5069532.1	0.0	0.5	0.3	10.9	0.0	249.4
AO7_OWF_GI16_2	577373.1	5069523.5	0.3	2.4	0.5	29.2	4.6	84.0
AO7_OWF_GI16_3	576814.6	5069360.6	0.4	2.3	0.5	16.5	4.6	76.0