DGEC - Mediterranean 2DUHRS and UXO Survey

UXO Factual Report - Accepted

Project Document Code	6168_3-RR-02-A

Revision	Date	Description of Revision	Author	Checked	Approved
2.0	19/02/2025	Accepted	SKA	EVA	AML

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REVISION HISTORY

The table on this page should be used to explain the reason for the report revision and what has changed since the previous revision. It is the holder's responsibility to check that they hold the latest validated version.

Rev.	Date	Reason for amendments	Section changes from previous version
0.1	27/11/2024	First draft	N/A
1.0	02/12/2024	For client review	Minor amendments
2.0	19/02/2025	Revision, Accepted	Client comments addressed Ref. "6168_3-RR-02_UXO Factual Report_Rev2.0_CS_DNV_20240129"

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DEFINITIONS AND ABBREVIATIONS

Throughout this document the following terminology is used:

DGEC *Direction Générale de l'Energie et du Climat (DGEC) (Client)*
GEOxyz *GEOxyz (Contractor)*
Peak *Peak Processing (Sub-contractor)*

The abbreviations and units listed in the table below are used within this report. Where abbreviations used in this document are not included in this table, it may be assumed that they are either equipment brand names or company names.

Acronym	Description	Acronym	Description
2D	Two-Dimensional	QINSy	Quality Integrated Navigation System
ALARP	As Low As Reasonably Practicable	QPS	Quality Positioning Services B.V.
ASCII	American Standard Code for Information Interchange	RGB	Red Green Blue
CP	Controllable Pitch	RX	Receiver
EGN	Empirical Gain Normalisation	SBAS	Satellite-Based Augmentation System
EPSG	European Petroleum Survey Group	SBP	Sub-bottom Profiler
FMGT	Fledermaus Geocoder Toolbox	SHOM	Service Hydrographique et Oceanographique de la Marine
GNSS	Global Navigation Satellite System	SSS	Side Scan Sonar
GOVI	Geo Ocean VI	SVS	Sound Velocity Sensor
GRS80	Geodetic Reference System 1980	SWL	Safe Working Limit
HF	High Frequency	THU	Total Horizontal Uncertainty
HSE	Health, Safety and Environment	TVU	Total Vertical Uncertainty
IMU	Inertial Measurement Unit	UHR	Ultra-High Resolution
INS	Inertial Navigation System	UHRS	Ultra-High Resolution Seismic
LAT	Lowest Astronomical Tide	USBL	Ultra-Short Baseline
LF	Low Frequency	UTC	Universal Time Coordinated
MBES	Multibeam Echosounder	UTM	Universal Transverse Mercator
MRU	Motion Reference Unit	UXO	Unexploded Ordnance
PAM	Passive Acoustic Monitoring	WGS84	World Geodetic System 1984
PPS	Pulse per Second	ZH	Zero Hydrographic

REFERENCE DOCUMENTATION

Client Reference Documents

Documentation provided by the Client for the project is listed below.

Document Code/Category	Title
2023-DGEC-07 CCAP	Administrative clauses
2023-DGEC-07-RC	Tendering rules
2023-DGEC-07 AE annexe 2	Commitment on deadlines
2023-DGEC-07 CCTP	Technical proposal
DTS_BRGM	Desktop studies (geological)
DTS_SHOM	Desktop studies (bathymetry)
DTS_UXO	Desktop studies (UXO)

Company and Project Documents

Document Code/Category	Title
6168_3-PEP-01	Project Execution Plan
6168-PF-01	Processing Flow
6168_3-PDR-01	Project Document Register
6168_3-HSE-01	HSE Plan
6168_3-DDL-01	Data Deliverables List
6168_3-ERB-01	Emergency Response & Bridging Document
6168_3-PQP-01	Project Quality Plan
6168_3-PRA-01	Project Risk Assessment
6168_3-CM-01	Communication Matrix

1 INTRODUCTION

1.1 PROJECT OVERVIEW

As part of the development of offshore wind energy in France, the DGEC is responsible for the technical studies prior to the award of tenders for offshore wind farms. For each area identified as suitable for the development of wind farms, "de-risk studies" must be carried out in order to analyse the seabed on the surface and sub-surface.

1.1.1 Areas of Study

Four maritime façades have been identified to cover the areas where the development of offshore wind power is envisaged (Figure 1). The purpose of this contract is to carry out geophysical/geotechnical de-risking studies for approximately 7 to 8 sites spread throughout the metropolitan territory. This territory has been divided into 4 maritime façades:

- Eastern Channel North Sea (MEMN)
- North Atlantic Western Channel (NAMO)
- South Atlantic (SA)
- Mediterranean (MED)

These sites will be located in the continental shelf area, generally between 12 and 50 nautical miles from the coast.

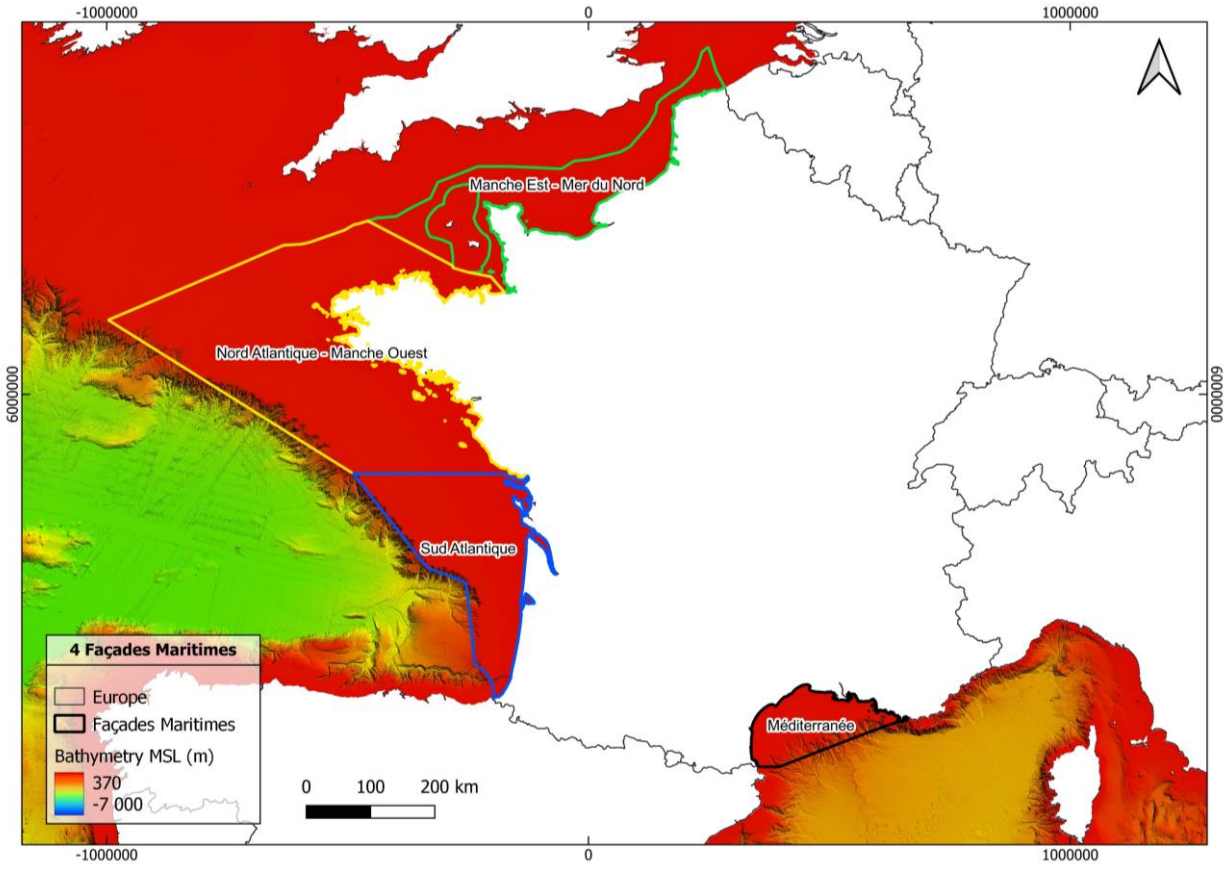


Figure 1: Project location overview - location of the 4 maritime facades

1.1.2 Objectives

The main objectives of the de-risk studies were to:

- Provide UHR seismic, MBES bathymetry, and side-scan sonar imaging data to define the location of UXO boxes.
- Provide data that will be used to issue ALARP certificates (created on the basis of MBES and SSS data) prior to the completion of geotechnical testing.

1.2 SCOPE OF WORK

The overall scope of work consisted of geophysical and UXO surveys in the Mediterranean zone. The UXO survey acquisition was conducted with the following sensors MBES and SSS. However, no magnetometer was displayed in this survey. This is due to the survey area is predominantly in a low risk area but also water depth of over 90 m and over 35 km from shore. This information is based on the DTS that 6 Alpha has prepared. In this DTS is noted that the UXO risk is significantly reduced in most offshore areas of the Study Site due to the substantial depth of water across the *Gulf of Lion*, which has enabled LOW categorisation of UXO risks to be defined across large swathes of the Study Site.

The UXO survey comprised the acquisition of multibeam bathymetry (MBES) and side scan sonar (SSS) sensor data on nine 60 x 60 metre box locations (shown in detail in APPENDIX A).

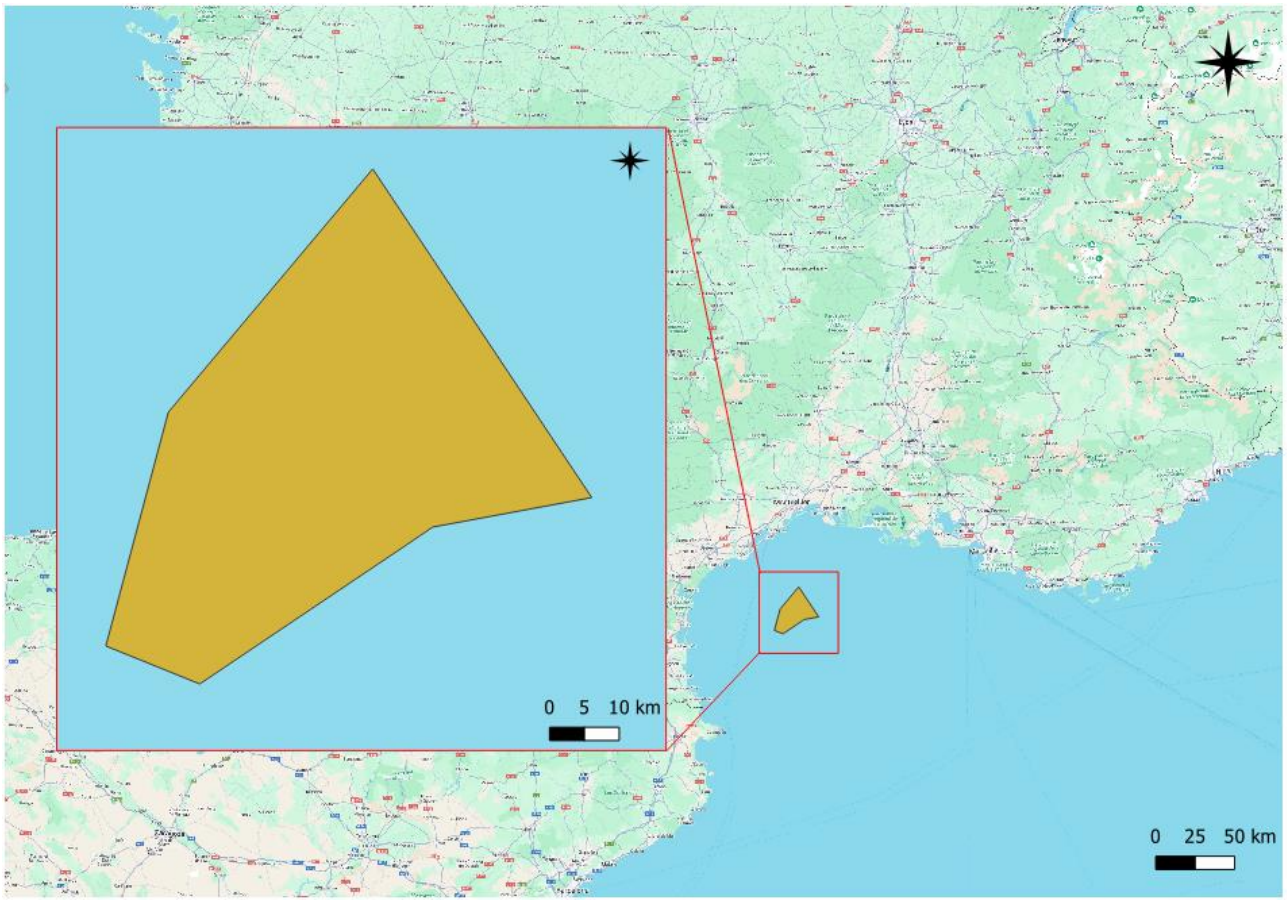


Figure 2: Scope of work area

The technical requirements for positioning and these individual components are defined in the client reference documents and summarised in the following sections. A total of 36 lines were acquired from the UXO surveys. The line plan for the run-in/run-out length was a minimum of 250 m from each side and a 60 m long.

As part of the UXO scope, ALARP certificates for the 60 m x 60 m boxes were issued via the UXO subcontractor GeoMines. The ALARP certificates contain as a minimum:

- A summary of the work carried out;
- A list of results with their classification, images and coordinates;
- Maps of the study area with all UXO-like observations and the avoidance radius;
- Where necessary, the radius around the observations must be provided.
- The signature of the Licensee's UXO specialist.

The process of issuing ALARP certificates goes as follows: After geophysical data analysis, the white zones, with risks as low as reasonably (ALARP) possible are sought. This is done by geospatial processing in GIS software. First, the areas that could not be considered as white areas are mapped, grouping the pUXO targets (sonar and MBES contacts) and potential saturated areas. Afterwards, the “avoidance areas” are mapped with an avoidance zone of safety buffer radius 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. The free space between these avoidance zones and the detection surface or survey boundary defines the outline of the ALARP certificate and the possible working area.

Two boxes (G6 and G9) have been moved from their original positions. The distance between the original and the new location is 2.4 m for each box.

1.3 SCOPE OF DOCUMENT

Table 1 lists all the reports delivered as part of this survey, with this report highlighted in **bold**.

Table 1: Project reports

Document Number	Title
6168_3-OR-01	Operations Report - GOVI
6168_3-MCR-01	Mobilisation & Calibration Report - GOVI
6168_3-RR-01	UHRS Factual Report
6168_3-RR-02	**UXO Factual Report (This Report)**

2 GEODETIC PARAMETERS AND TRANSFORMATIONS

2.1 HORIZONTAL DATUM

The geodetic datum and mapping coordinate system used for this project is WGS84 UTM Zone 31N. All coordinates used are referenced to the geodetic datum and grid parameters listed in Table 2 and Table 3 below.

Table 2: Datum parameters

Parameter	Details
Geodetic Datum	World Geodetic System 1984 (WGS84)
EPSG Coordinate Reference System	4258
Spheroid	GRS80
EPSG Ellipsoid Code	7019
Semi-Major Axis	6378137.000
Semi-Minor Axis	6356752.31424
Flattening	1/298.257223563
Eccentricity Squared	0.00669428002290

Table 3: Projection parameters

Parameter	Details
EPSG Coordinate Reference Code	32631
Projection	UTM
Zone	31N
Central Meridian	3° East
Latitude of Origin	0°
False Easting	500000.00 m
False Northing	0.00 m
Scale Factor at Central Meridian	0.9996
Units	Metres

2.2 VERTICAL REFERENCE

The vertical datum for the project is the Zéro Hydrographique (ZH) defined by the surface Lowest Astronomical Tide (LAT). Reduction was made via the SHOM Bathyelli (PBMA in French) v2.1 model.

2.3 TIME AND LOG KEEPING

UTC has been used for record keeping during the project (including the Daily Progress Reports, unless stated otherwise). The vessel maintained local time for operations.

Data time-tagging and synchronization used UTC (Universal Time Coordinated). All data recorded in the online navigation software will be time stamped where appropriate using the time string and the pulse-per-second (PPS) from the GNSS.

2.4 SURVEY UNITS

The following survey units were used during the project and throughout this report;

- Linear units are expressed in international metres (m)
- Angular units are expressed in degrees (°)

3 RESOURCES

3.1 VESSEL AND OPERATIONAL SUMMARY

The survey vessel Geo Ocean VI (GOVI) was utilised to complete the SBP / MBES / 2D UHRS / SSS survey. A summary of the survey operations is outlined in Table 4.

Table 4: Overview of survey operations

Vessel	Dates	Activity
Geo Ocean VI	Geophysical survey: 09/10/2024 – 20/10/2024 UXO survey: 20/10/2024 – 22/10/2024	SBP / MBES / 2D UHRS / SSS acquisition survey, transit etc.

The specifications of the GOVI are summarised in Table 5.

Table 5: Survey vessel specifications

Geo Ocean VI	Specifications	
	Length:	53.8 m
	Width:	13.0 m
	Maximum draught:	4.8 m
	Cruising speed:	5 knots
	Main Propulsion:	2x Hybrid propulsion package on Berg CP propellers
	Endurance:	24 h day operations (28 days)
	Accommodation:	30
	Positioning:	Station Keeping/Autopilot
	A-Frame:	A-frame (4.5 x 8.0 m) SWL 15 tonnes
	Crane:	2.4 tonnes @ 8 m

3.2 EQUIPMENT

The equipment used for the survey is summarised in Table 6.

Table 6: Survey equipment specifications

Equipment	Manufacturer	Model / Type
GNSS primary GNSS secondary	Trimble Trimble	BX992 c/w OmniSTAR G4+ BX992 c/w OmniSTAR XP
Primary INS / MRU Secondary INS/MRU	iXblue SBG	Hydrins Apogee-I-B Surface IMU
MBES (Hull-mounted)	Kongsberg	EM2040 RX (Port & Stbd) EM2040 TX(Centre) EM2040 PU (Master) EM2040 PU (Slave)
SSS	Edgetech 4205	300/600 or 300/900
Sound velocity	Valeport	Swift 500 Mini SVS (USBL pool mounted)

Equipment	Manufacturer	Model / Type
		Mini SVS+P (towed equip) Mini SVS+P (towed equip)
UHR streamer	Geoeel	Active Streamer Length: 96 m Configuration: 1x 96 m Tow cable – 1x 5m Stretch – 48ch @ 2 m Group Interval, 1x 5m Tail stretch, 3x LH16 Digitiser Units
Sparker	Duraspark	Duraspark 400
Sparker and Tail Buoy GNSS	Applied Acoustics	Minipod 101G (SBAS)

3.3 SOFTWARE

The software that was used for data acquisition and processing is outlined in Table 7 below.

Table 7: Project software list

Equipment / Data Type	Acquisition	Processing
Navigation, MBES, GNSS	QPS QINSy	n/a
MBES	QPS QINSy	Qimera / FMGT QPS BeamworX Autoclean QGIS
SSS	Edgetech Discover	Sonarwiz
SBP (sparker)	Coda Geosurvey	Shearwater Reveal Advanced Marine v.5.1 IHS Kingdom version 2016 64 bit
UHR Streamer	48 channel streamer (ch1-24@1m int & ch25-48@2m int)	Shearwater Reveal Advanced Marine v.5.1 IHS Kingdom version 2016 64 bit
Passive Acoustic Monitoring (PAM)	Subacoustech, 4 broadband elements (up to 250khz) with PAMGuard (plus spare system)	n/a
DigiCourse Bird Controllers	ION System 3 v7.21	n/a

4 DATA PROCESSING

4.1 MULTIBEAM ECHOSOUNDER

4.1.1 Data acquisition and settings

The primary settings used for the project are outlined in Table 8.

Table 8: MBES system settings

Kongsberg EM2040 (DH/DSW)	Head 1 port	Head 2 stbd
Survey speed	Average 4 knots	
High Frequency (used during survey)	400kHz	400kHz
Low Frequency	200kHz	200kHz
Bottom sampling	High Density Dual Swath (1024 beams)	
Operational Mode	Ultra High density	
Range	2 x water depth	
Power	Maximum	
Pulse length	Auto	
Patch test roll	-41.288°	40.831°
Patch test pitch	-0.530°	-0.834°
Patch test heading	180.476°	180.192°
Sector width	55°	55°
Ping rate	9Hz - 14Hz dependant on range	
Software and version	Qinsy 9.6.4	

The MBES project specifications are listed in Table 9.

Table 9: MBES specifications

Item	Specification
Minimum data density	30 HC/m² until 50 m of water depth 15 HC/m² between 50 – 150 m of water depth 9 HC/m² between 150 – 200 m of water depth
Bin size	0.2 m for <25 m of water depth 0.5 m for 25 m – 50 m of water depth 1 m for 50 m – 200 m of water depth
Grid	0.5 m cell size
Gridded standard deviation	≤0.20m per 1 m² bin
Coverage	100 % with 30% overlap between adjacent survey lines
TVU	0.8 m
THU	2 m
Backscatter	Recorded not processed

4.1.2 Overview of the methodology

Bathymetric data was recorded in QINSy as raw QPD files. The data was initially checked offline into the QPS processing software Qimera for quality, coverage, and density requirements. Data processing was carried out using Qimera and AutoClean. First, a rough cleaning was applied in Qimera to remove major spikes and noise. In addition, any SVP/refraction and GNSS drop out issues were fixed. Afterwards, FAU files were exported to continue processing with Autoclean. Bathymetric data was cleaned on a line-by-line basis and/or by using area-based cleaning tools in the processing software. A combination of basic filters applied to the entire data set and then individual QPDs manually cleaned by deleting any further outliers visible within the data.

Figure 3 outlines the general MBES processing workflow.

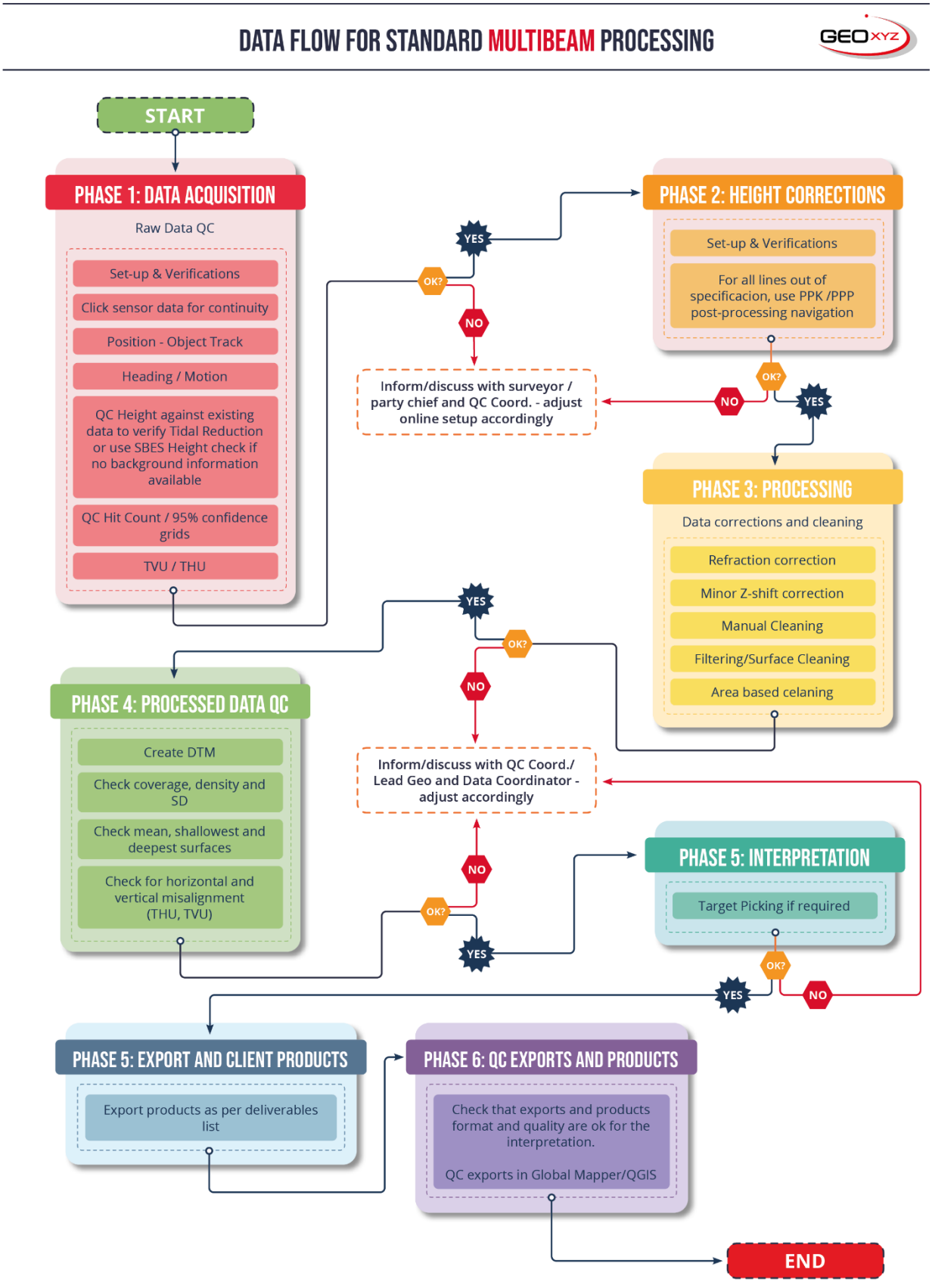


Figure 3: MBES processing workflow

4.1.3 Data quality assessment

The multibeam echosounder data was of high quality with very little acoustic noise.The THU and TVU values for each block/survey box are within the threshold specified by the IHO Special Order S-44 (Table 10) and the specifications defined by the client.

These values have been calculated according to the IHO S44 Special Order threshold. TVU has been calculated following to this formula:

$$TVU_{max}(d) = \sqrt{a^2 + (b \times d)^2}$$

Where **a**, represents that portion of the uncertainty that does not vary with the depth (0.25 m for Special Order); **b**, is a coefficient which represents that portion of the uncertainty that varies with the depth (0.0075 for Special Order) and **d**, is the depth. THU is, according to the IHO Special order, a fix value of 2 meters (https://iho.int/uploads/user/pubs/standards/s-44/S-44_Edition_6.1.0.pdf).

Table 10: THU and TVU values and thresholds for the UXO survey

Survey box	TVU in block	IHO TVU threshold	THU in block	IHO THU threshold
G1	0.11-0.13	0.86	0.86-0.91	2.00
G2	0.12-0.13	0.86	0.87-0.91	2.00
G3	0.12-0.13	0.88	0.90-0.95	2.00
G4	0.12-0.13	0.90	0.91-0.96	2.00
G5	0.12-0.13	0.87	0.88-0.91	2.00
G6	0.11-0.13	0.88	0.88-0.93	2.00
G7	0.11-0.12	0.88	0.89-0.93	2.00
G8	0.11-0.14	0.91	0.94-0.99	2.00
G9	0.11-0.13	0.86	0.86-0.91	2.00

4.1.4 MBES deliverables

The MBES deliverables created as a result of the project are outlined in Table 11.

Table 11: Overview of the MBES deliverables

Deliverable	Format
RAW bathymetric data	QPD or bwxraw
Despiked, motion and tidal corrected point cloud	ASCII
Bathymetric average values gridded surface	ASCII, RGB TIF, Encoded TIF or FLT
Bathymetric density (Hit Count) values gridded surface	ASCII, RGB TIF, Encoded TIF or FLT
Bathymetric slope values gridded surface	RGB TIF, Encoded TIF or FLT
Bathymetric Contour Lines	SHP
MB Targetlist	ASCII, SHP

4.2 SIDE SCAN SONAR

4.2.1 Data acquisition and settings

Side Scan Sonar data was acquired following specifications listed in Table 12 below.

Table 12: SSS specifications

Item	Specification
Frequency	Simultaneous dual frequency (600kHz / 900kHz) as specified in project documentation
Altitude	10-15% of the range, so between 5-7m
Sonar Range	Same range for both HF and LF, range dependent on project requirements (hits on target, resolution and coverage required)
SSS Acquisition Mode	High-Definition Mode (Standard single pulse operating mode)
Survey Speed	The side scan sonar will be towed at a speed such that an object of length 1m will be sampled a minimum of 3 times per pass.
Raw Data Format	Make sure Discover is recording JSF and XTF
File size	Make sure Discover is recording with a maximum size limit at 400 Mb
Positioning Accuracy	0.3% of USBL slant range increasing 0.1 degree per 10 degrees of elevation plus heading error; +/- 2m relative to MBES surface at mid-range after final navigation corrections applied
Coverage	200% (nadir covered) - as specified in project documentation
Target Picking	No specifications, all contact seen within the UXO Box should be picked
Frequency	Simultaneous dual frequency (600kHz / 900kHz) as specified in project documentation
Altitude	10-15% of the range, so between 5-7m
Sonar Range	Same range for both HF and LF, range dependent on project requirements (hits on target, resolution and coverage required)

4.2.2 Overview of the methodology

The side scan sonar (SSS) processing is conducted only on high frequency (HF) data, with the objective of detecting and classifying contacts in order to assess possible UXO threats. LF is recorded but we won't supply the processed mosaic.

The HF SSS data were processed using the Chesapeake SonarWiz software following the workflow outlined in Figure 4.

Navigation data from the QINSy logfile was injected into the sonar files using Nav Injector Pro. The SSS data were then loaded into SonarWiz, the seabed was bottom-tracked, minor heading corrections were applied to the navigation where needed and any spikes smoothed out. The Empirical Gain Normalisation (EGN) was applied to normalise the signal return along the record, in order to clarify changes in the acoustic reflectivity of the seabed and the presence of any morphological features. A de-stripe filter was applied, whenever necessary, to create a well-balanced sonar image.

Finally, geotiffs were exported per line for calculating coverage, followed by an export of the deliverables as per the deliverable list.

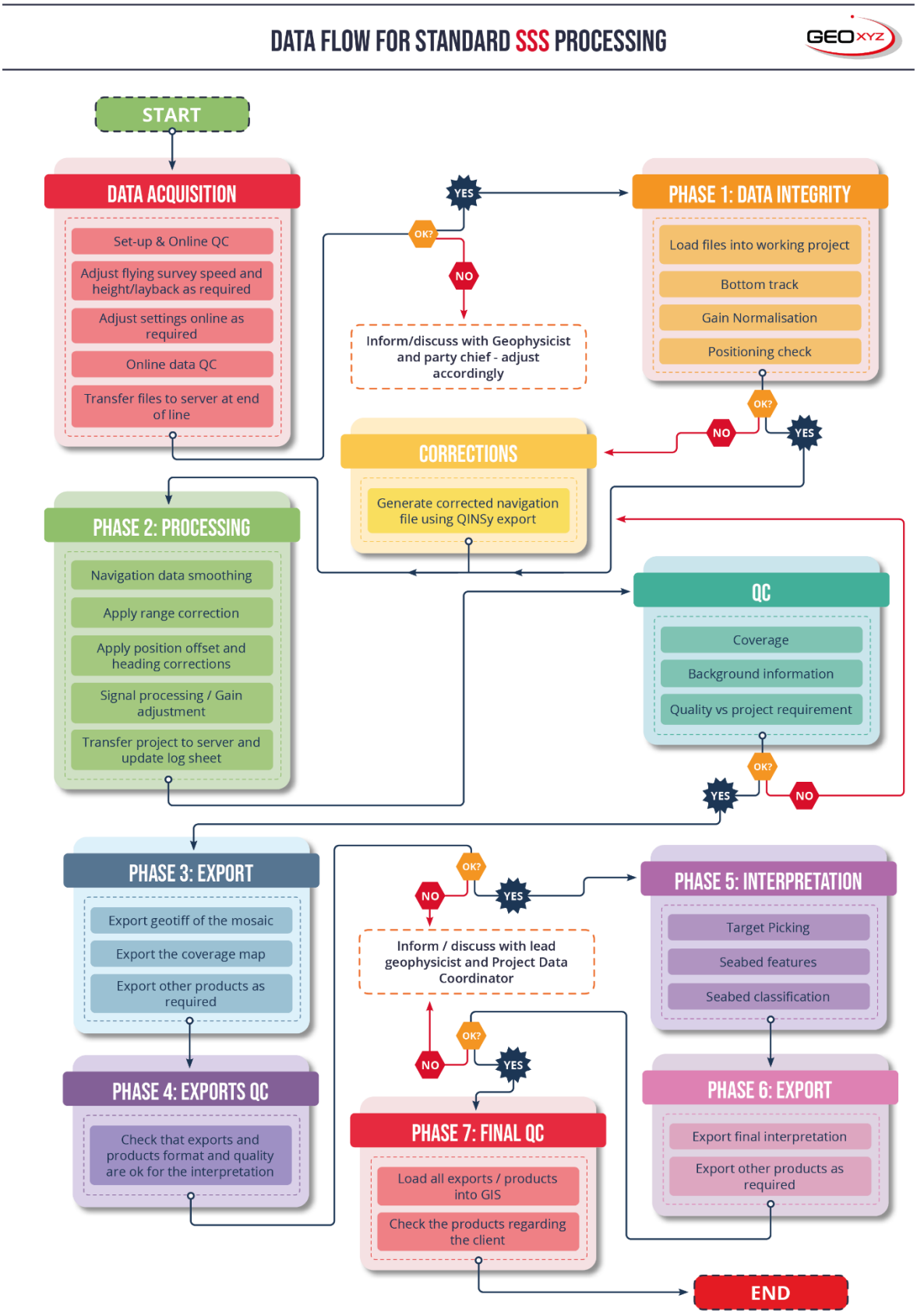


Figure 4: SSS processing workflow

4.2.3 Data quality assessment

SSS data was collected for nine UXO low-risk zone locations. The data was of satisfactory quality and within client requirements.

4.2.4 SSS deliverables

The SSS deliverables created as a result of the project are outlined in Table 13.

Table 13: Overview of the SSS deliverables

Deliverable	Format
RAW SSS data	JSF, HF XTF
Processed SSS data	HF XTF
SSS mosaic	RGB TIF
SSS Targetlist	ASCII, Excel
Seabed Features Lines, Polygons	SHP
Seabed Sediments Primary	SHP

5 RESULTS

5.1 OVERVIEW

The results of the survey per survey box have been shown in APPENDIX A. Each of the charts in the appendix contains a bathymetric overview, seabed sediment classification, seabed features overlain on HF side scan mosaic and the location of the shown survey box.

No targetlist has been provided as part of the deliverables as no targets were recorded within the surveyed areas.

Based on the MBES and SSS data acquired in the survey, ALARP certificates were issued and can be found attached to this report (APPENDIX B).

5.2 BATHYMETRY

The bathymetric data was acquired in a one-metre resolution and has been shown in the top-left chartlet of the charts found in APPENDIX A.

Within each of the survey boxes, the bathymetry ranges vary less than a metre.

The deepest point of the surveyed areas is located in the G8 box, lying at a depth of -101.48 m LAT. The shallowest point is located in the G1 box, lying at a depth of -92.59 m LAT.

The only notable features seen in the bathymetric data are trawl marks (more on trawl marks in chapter 5.3).

5.3 SEABED SEDIMENTS AND FEATURES

In each of the survey box areas, only medium sand is present in terms of sedimentation (top-right chartlet in APPENDIX A).

No targets were identified within the UXO survey boxes.

The only seabed feature type found in the surveyed areas are trawl marks. Their number and distribution are shown in Table 14, while their exact locations are shown in the lower-left panels of charts found in APPENDIX A.

Table 14: Number and distribution of trawl marks within the surveyed areas

Survey box	Number of trawl marks
G1	1
G2	4
G3	0
G4	6
G5	4
G6	9
G7	2
G8	3

Survey box	Number of trawl marks
G9	11
Total	**40**

6 CONCLUSION

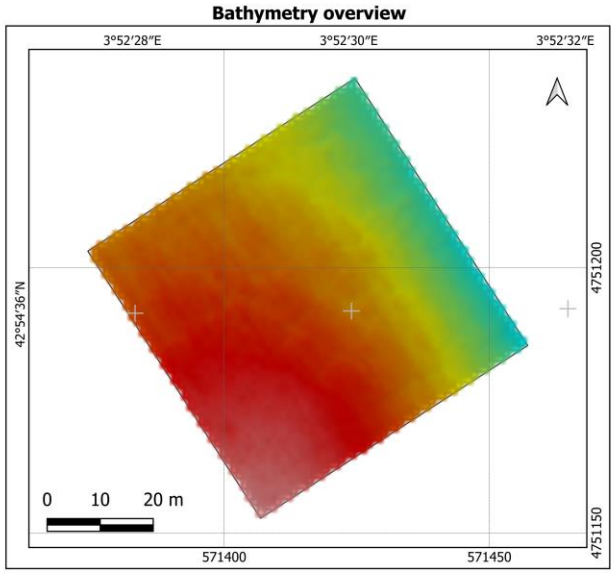
A UXO survey was conducted for nine 60 x 60 metre survey boxes within the Mediterranean zone. The survey comprised the acquisition of multibeam bathymetry (MBES) and side scan sonar (SSS) sensor data, which the survey vessel Geo Ocean VI (GOVI) was utilised for. The survey was conducted between 20/10/2024 and 22/10/2024.

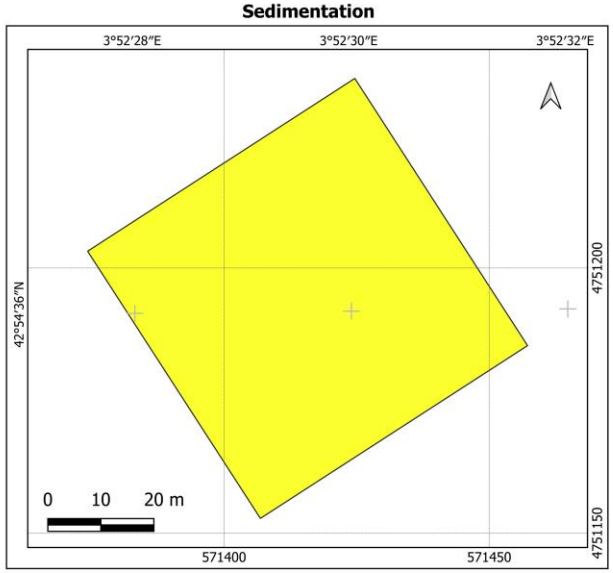
Based on the MBES and SSS data acquired in the survey, ALARP certificates were issued.

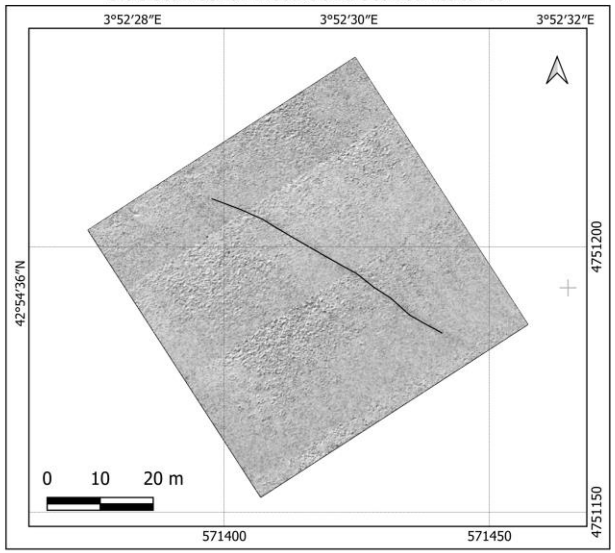
In terms of bathymetry, within each of the survey boxes, the bathymetry ranges vary less than a metre. The deepest point of the surveyed areas is located in the G8 box, lying at a depth of -101.48 m LAT. The shallowest point is located in the G1 box, lying at a depth of -92.59 m LAT. The only notable features seen in the bathymetric data are trawl marks.

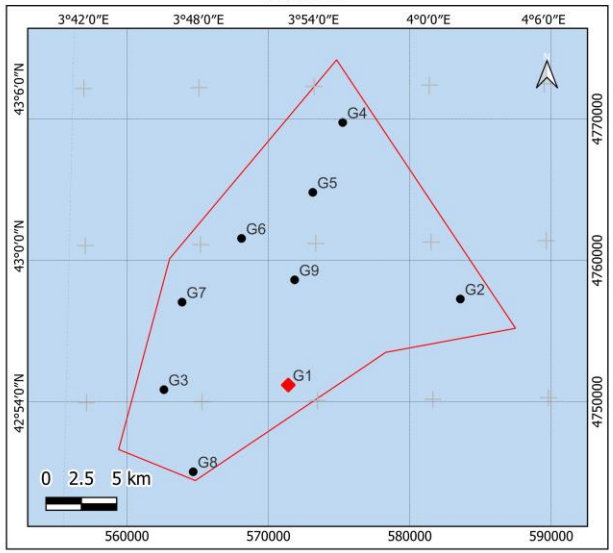
In each of the survey box areas, only medium sand is present in terms of sedimentation. No targets were identified within the UXO survey boxes. The only seabed feature type found in the surveyed areas are trawl marks. There were 40 recorded trawl marks in total. None were recorded in the G3 box, while boxes G9 and G6 contained eleven and nine trawl marks, respectively.

APPENDIX A. SURVEY BOX CHARTS









Legend

Bathymetry:
Elevation in m LAT
-93.5 -92.5

Sedimentation:
Medium sand

Seabed features:
Trawl mark

Survey boundaries and sites:
Mediterranean zone boundary
Survey box boundary
Survey site

Location information

Location: G1
Geodesy: WGS84 UTM 31N
Easting: 571415 E
Northing: 4751194 N

DGEC - Mediterranean 2DUHRS and UXO Survey
UXO Factual Report
6168_3-RR-02

MINISTÈRE DE LA TRANSITION ÉNERGÉTIQUE
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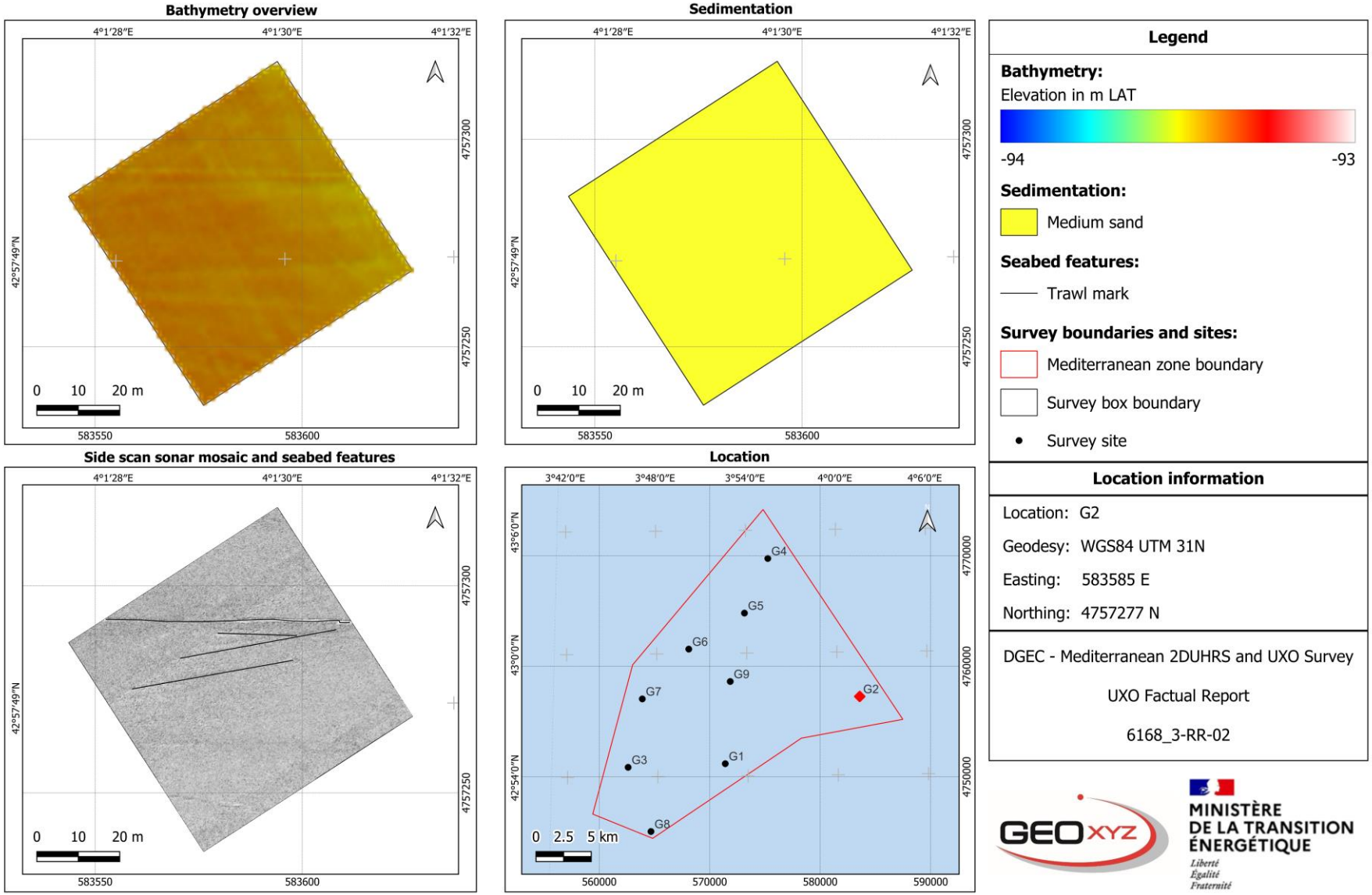
Bathymetry overview
Sedimentation
Side scan sonar mosaic and seabed features
Location
4°1'28"E
4°1'30"E
4°1'32"E
42°57'49"N
4757300
4757250
583550
583600
0 10 20 m
3°42'0"E
3°48'0"E
3°54'0"E
4°0'0"E
4°6'0"E
43°6'0"N
43°0'0"N
42°54'0"N
4770000
4760000
4750000
560000
570000
580000
590000
0 2.5 5 km
G1
G2
G3
G4
G5
G6
G7
G8
G9
Legend
Bathymetry:
Elevation in m LAT
-94
-93
Sedimentation:
Medium sand
Seabed features:
Trawl mark
Survey boundaries and sites:
Mediterranean zone boundary
Survey box boundary
Survey site
Location information
Location: G2
Geodesy: WGS84 UTM 31N
Easting: 583585 E
Northing: 4757277 N
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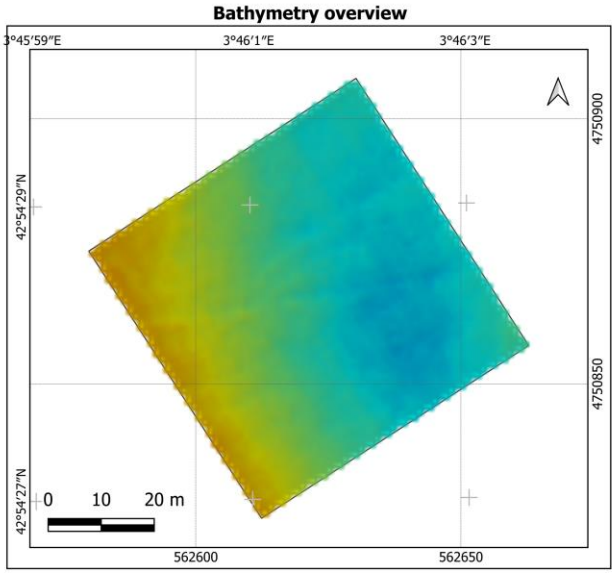

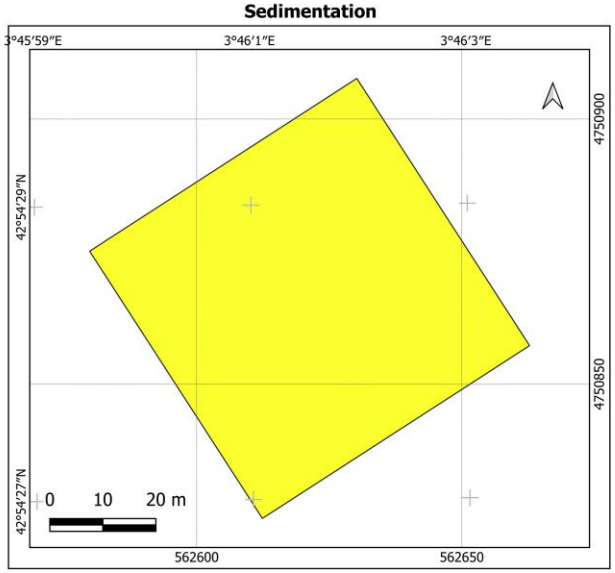

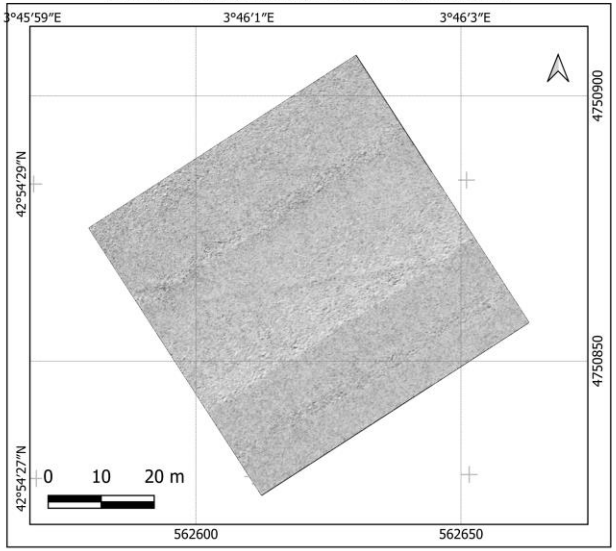

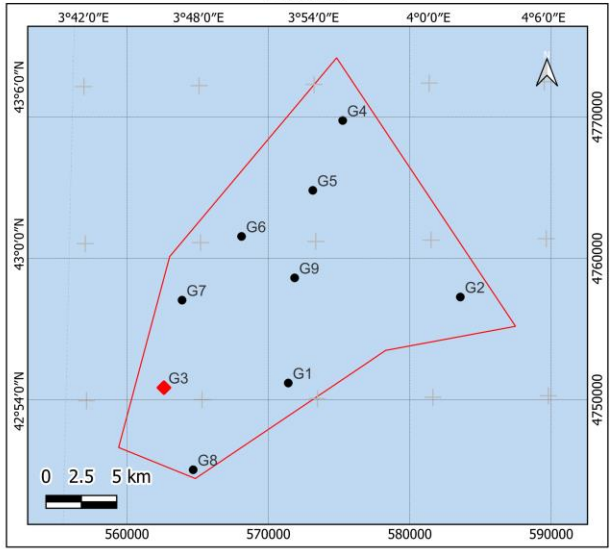

Legend

Bathymetry:
Elevation in m LAT

-97.5 -96.5

Sedimentation:
Medium sand

Seabed features:
Trawl mark

Survey boundaries and sites:
Mediterranean zone boundary
Survey box boundary
Survey site

Location information

Location: G3
Geodesy: WGS84 UTM 31N
Easting: 562621 E
Northing: 4750866 N

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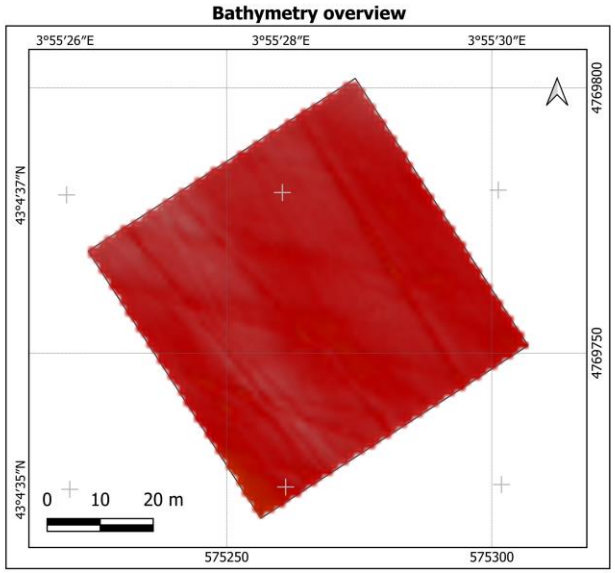

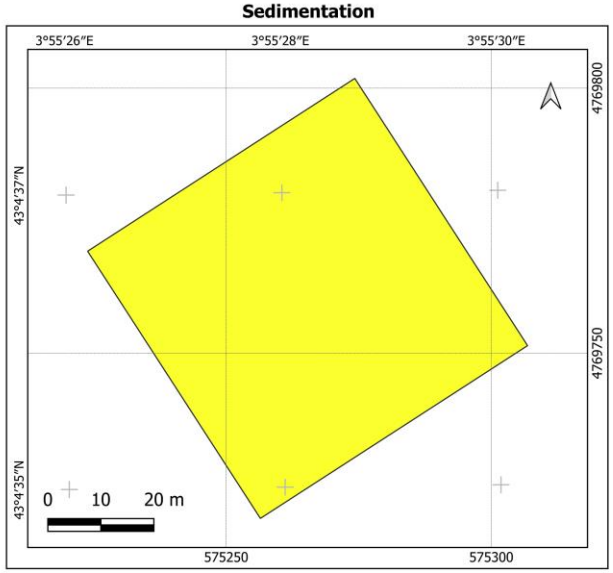

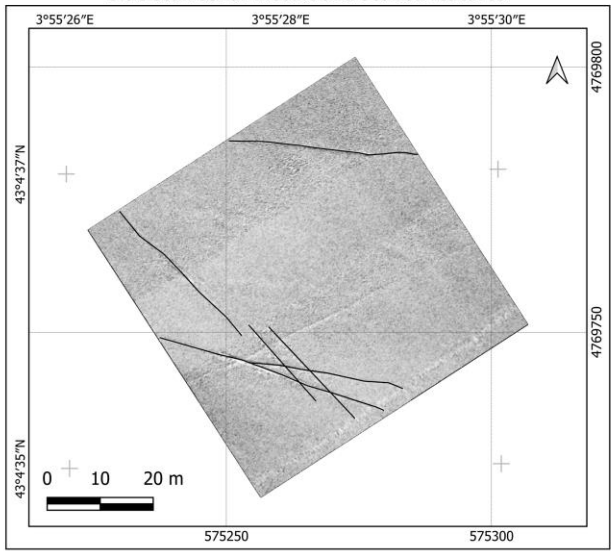

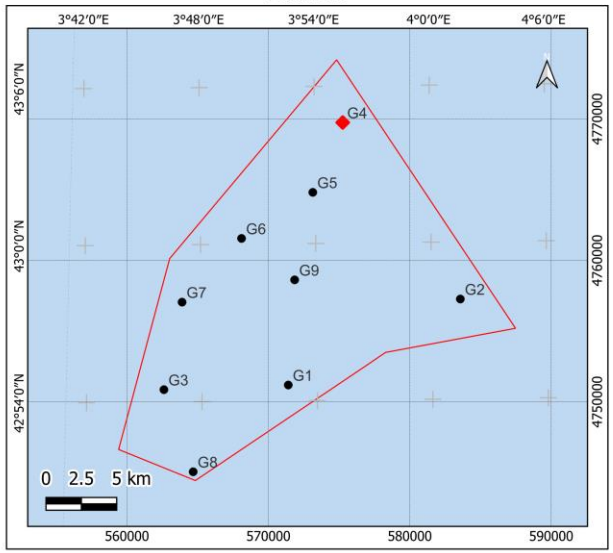

Legend

Bathymetry:
Elevation in m LAT
-100 -99

Sedimentation:
Medium sand

Seabed features:
Trawl mark

Survey boundaries and sites:
Mediterranean zone boundary
Survey box boundary
Survey site

Location information

Location: G4
Geodesy: WGS84 UTM 31N
Easting: 575265 E
Northing: 4769760 N

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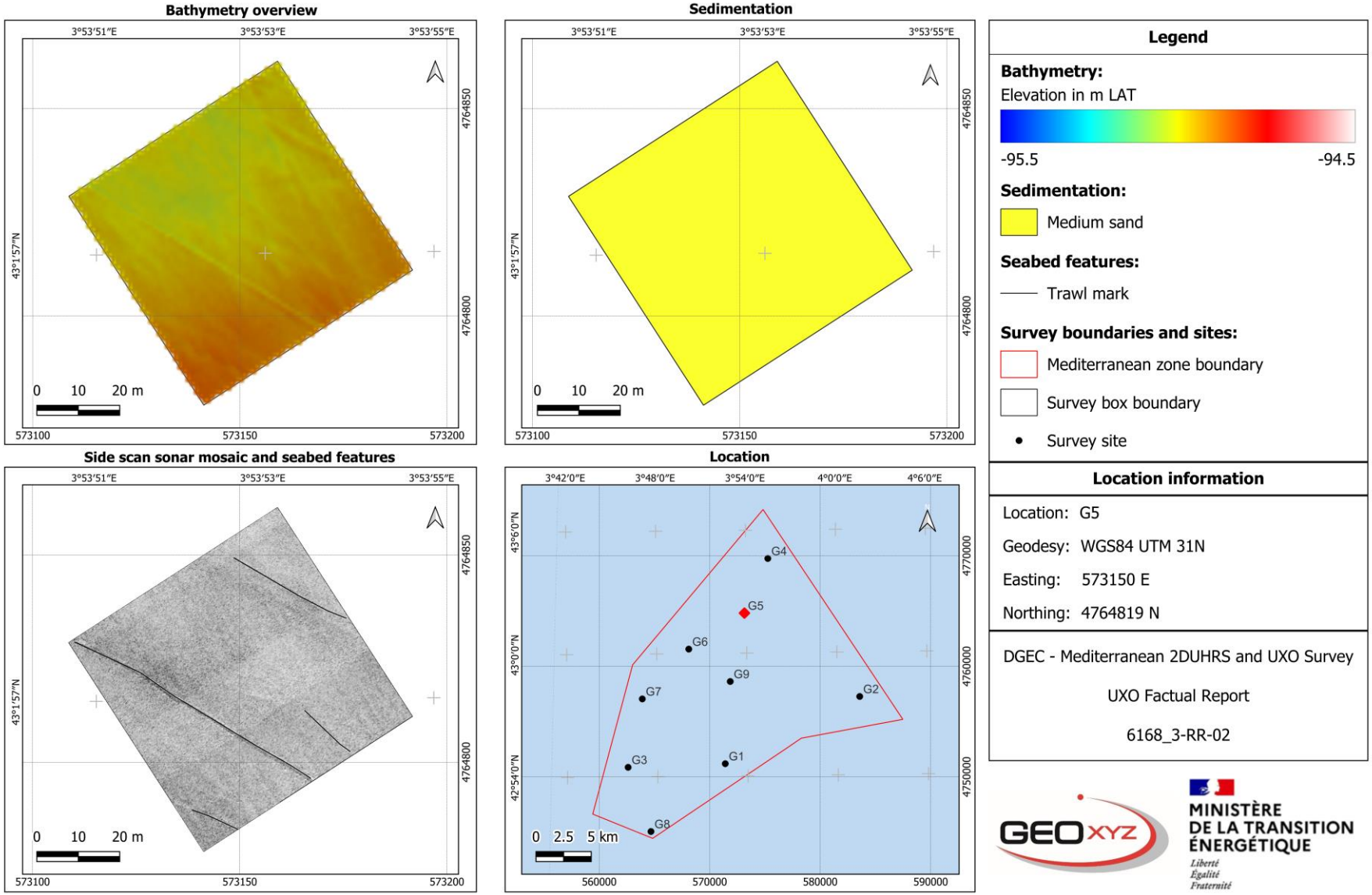
Bathymetry overview
Sedimentation
Side scan sonar mosaic and seabed features
Location
3°53'51"E
3°53'53"E
3°53'55"E
43°1'57"N
4764850
4764800
0 10 20 m
573100
573150
573200
3°42'0"E
3°48'0"E
3°54'0"E
4°0'0"E
4°6'0"E
43°6'0"N
43°0'0"N
42°54'0"N
4770000
4760000
4750000
0 2.5 5 km
560000
570000
580000
590000
G1
G2
G3
G4
G5
G6
G7
G8
G9
Legend
Bathymetry:
Elevation in m LAT
-95.5
-94.5
Sedimentation:
Medium sand
Seabed features:
Trawl mark
Survey boundaries and sites:
Mediterranean zone boundary
Survey box boundary
Survey site
Location information
Location: G5
Geodesy: WGS84 UTM 31N
Easting: 573150 E
Northing: 4764819 N
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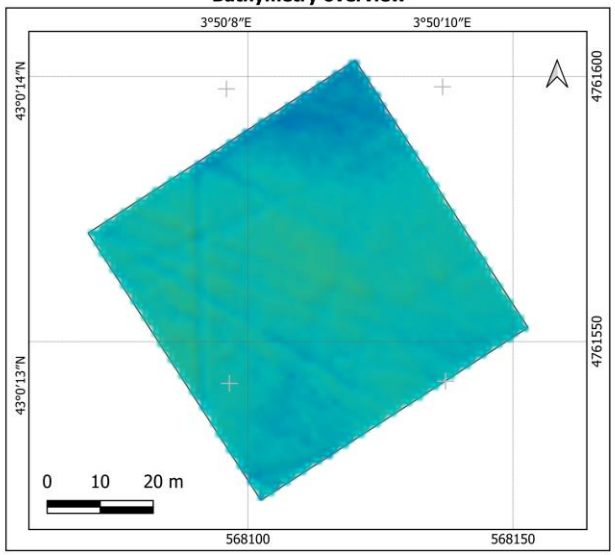
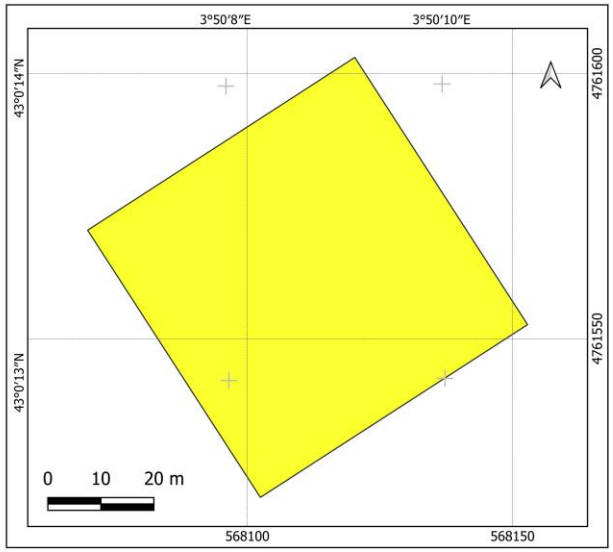
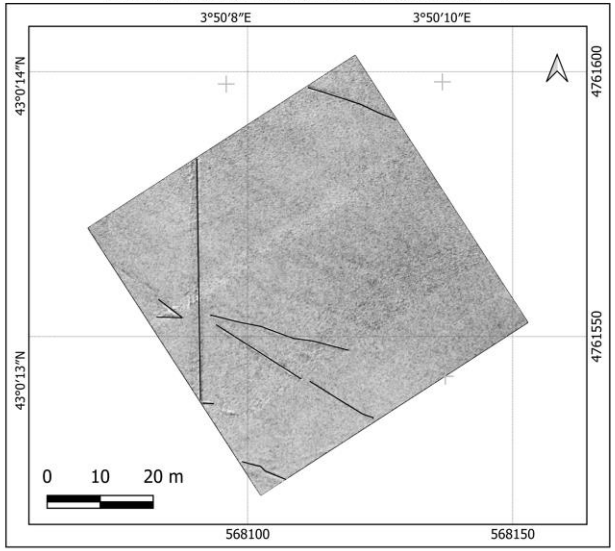
Bathymetry overview



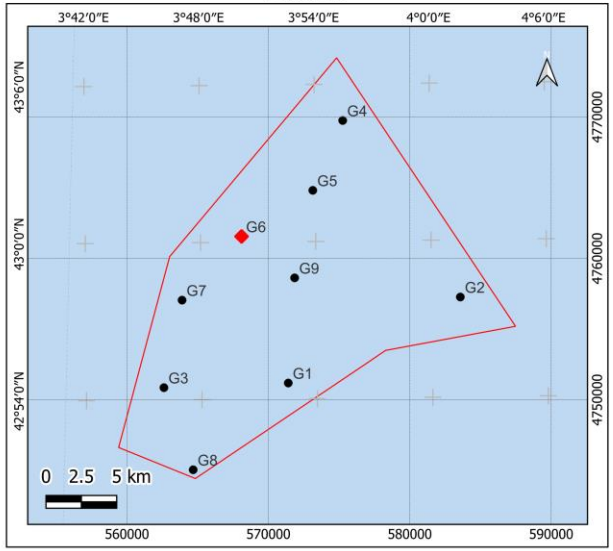
Sedimentation



Side scan sonar mosaic and seabed features



Location



Legend

Bathymetry:
Elevation in m LAT

-96 -95

Sedimentation:
Medium sand

Seabed features:
Trawl mark

Survey boundaries and sites:
Mediterranean zone boundary
Survey box boundary
Survey site

Location information

Location: G6
Geodesy: WGS84 UTM 31N
Easting: 568111 E
Northing: 4761561 N

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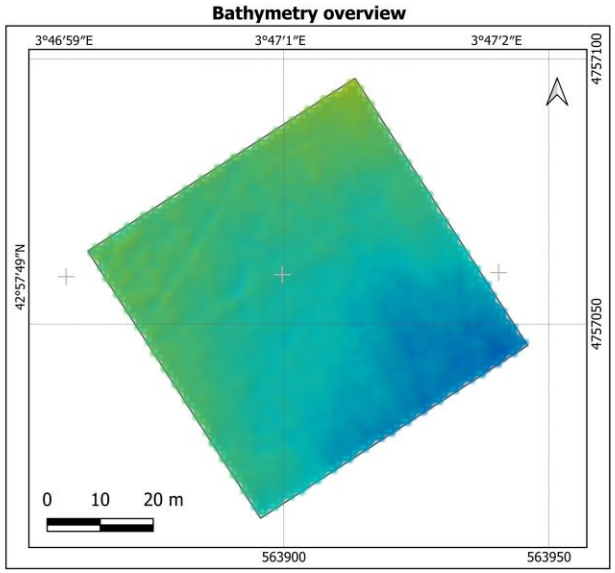

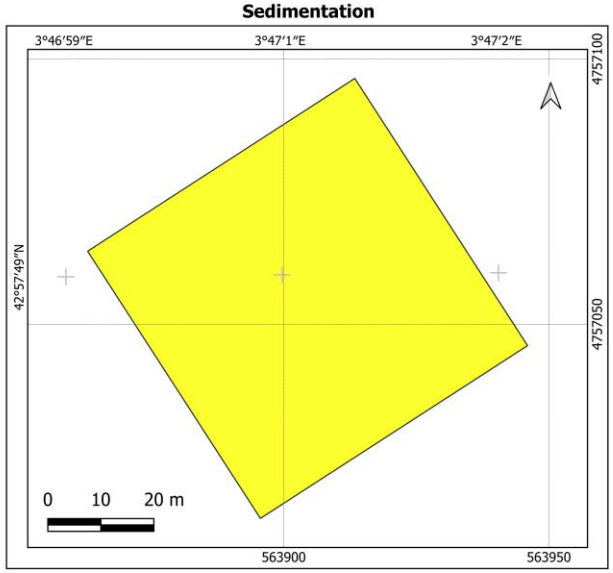

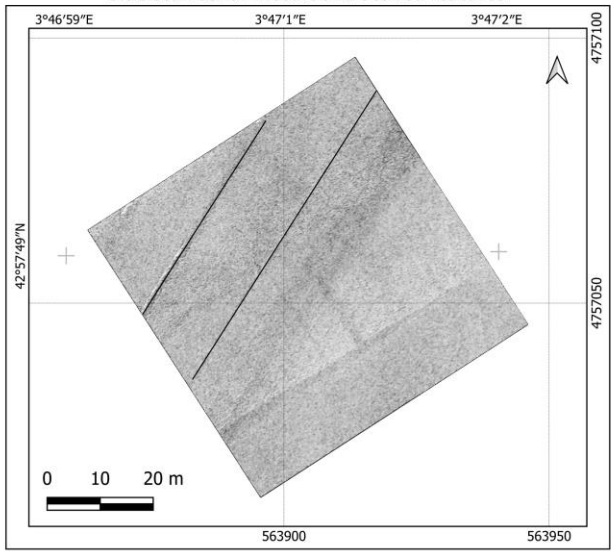

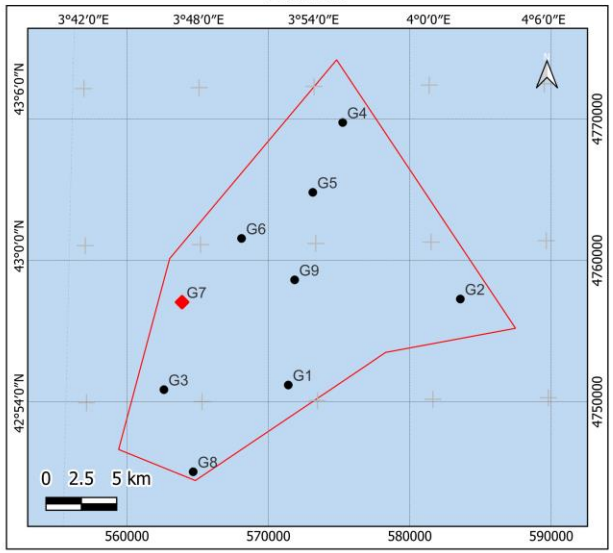

Legend

Bathymetry:
Elevation in m LAT
-97 -96

Sedimentation:
Medium sand

Seabed features:
Trawl mark

Survey boundaries and sites:
Mediterranean zone boundary
Survey box boundary
Survey site

Location information

Location: G7
Geodesy: WGS84 UTM 31N
Easting: 563904 E
Northing: 4757054 N

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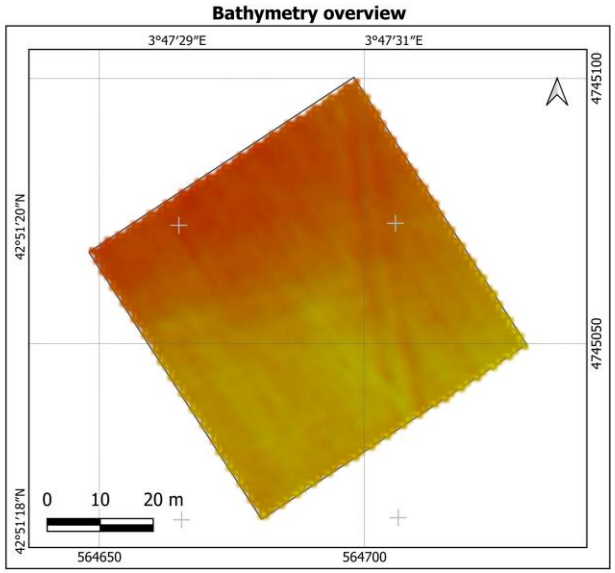

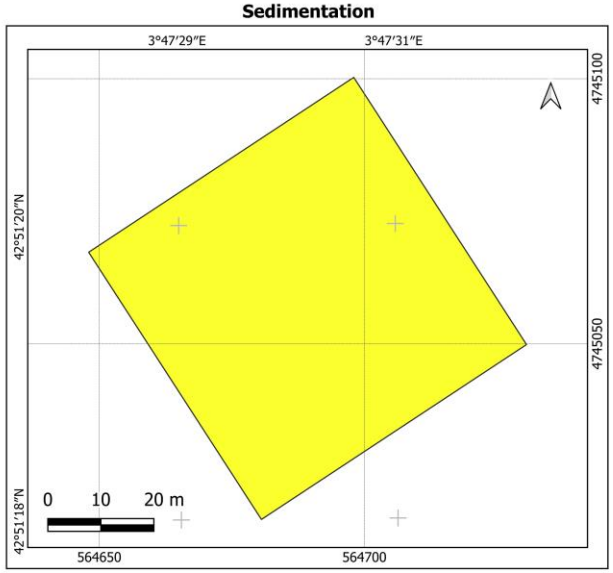

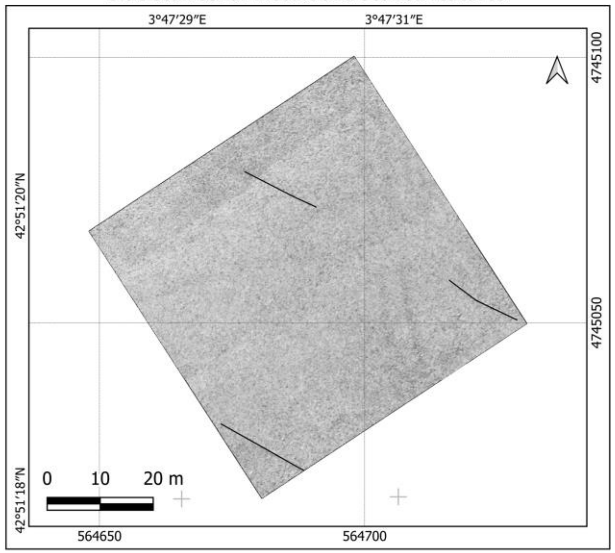

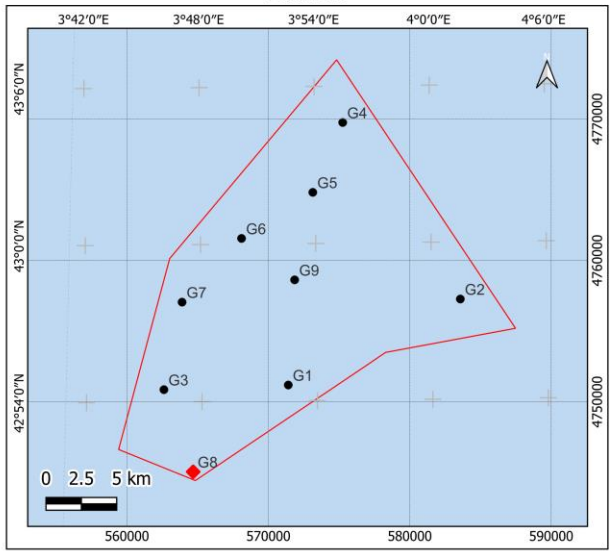

Legend

Bathymetry:
Elevation in m LAT
-102 -101

Sedimentation:
Medium sand

Seabed features:
Trawl mark

Survey boundaries and sites:
Mediterranean zone boundary
Survey box boundary
Survey site

Location information

Location: G8
Geodesy: WGS84 UTM 31N
Easting: 564689 E
Northing: 4745058 N

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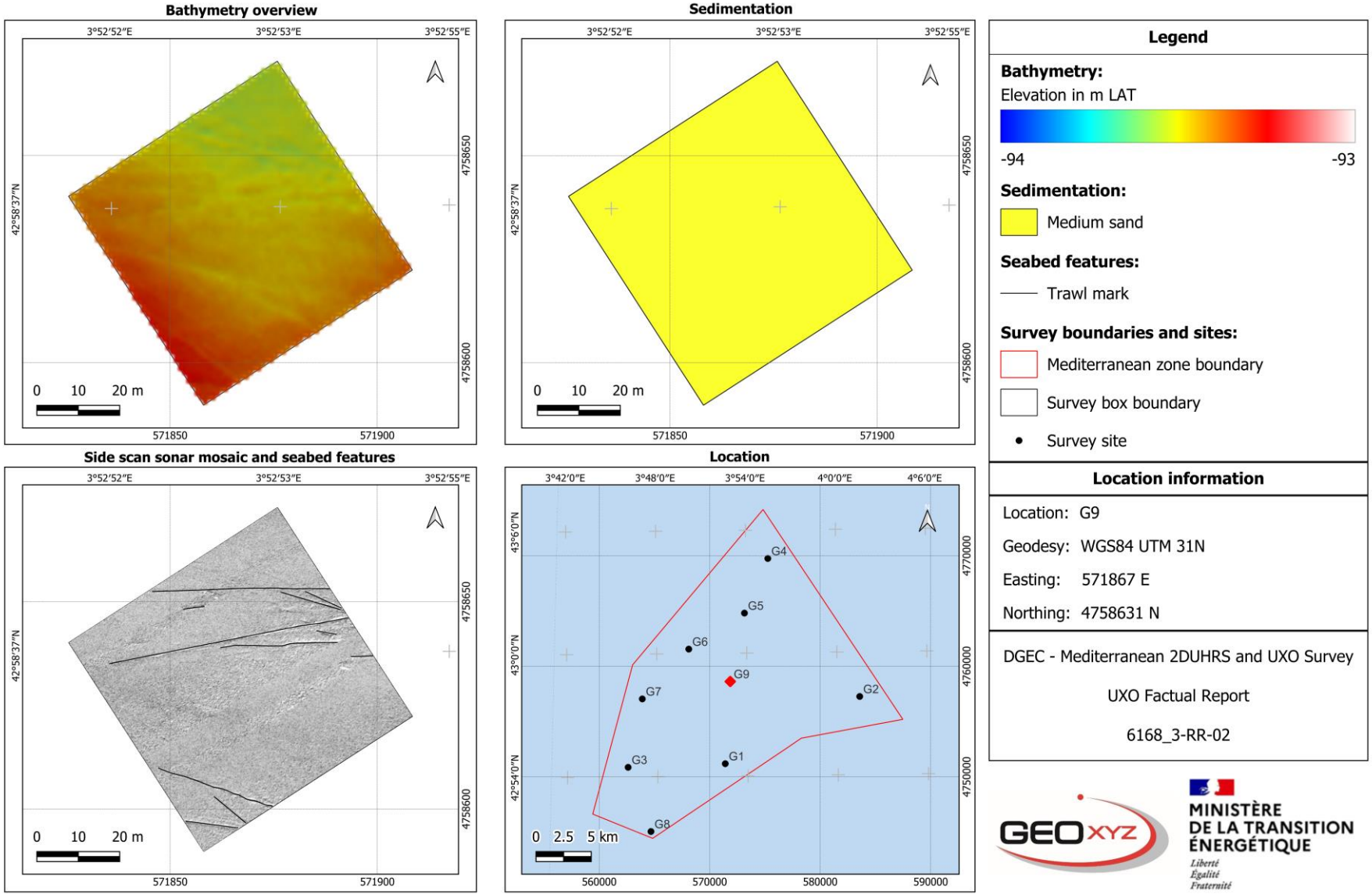
Bathymetry overview
3°52'52"E
3°52'53"E
3°52'55"E
42°58'37"N
4758650
4758600
0 10 20 m
571850
571900
Sedimentation
Side scan sonar mosaic and seabed features
Location
3°42'0"E
3°48'0"E
3°54'0"E
4°0'0"E
4°6'0"E
43°6'0"N
43°0'0"N
42°54'0"N
4770000
4760000
4750000
0 2.5 5 km
560000
570000
580000
590000
G1
G2
G3
G4
G5
G6
G7
G8
G9
Legend
Bathymetry:
Elevation in m LAT
-94
-93
Sedimentation:
Medium sand
Seabed features:
Trawl mark
Survey boundaries and sites:
Mediterranean zone boundary
Survey box boundary
Survey site
Location information
Location: G9
Geodesy: WGS84 UTM 31N
Easting: 571867 E
Northing: 4758631 N
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APPENDIX B. ALARP CERTIFICATES