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DGEC - BNO 2DUHRS and UXO Survey

UXO Factual Report - Accepted

Project Document Code	6168_4-RR-02-A

Revision	Date	Description of Revision	Author	Checked	Approved
2.0	01/08/2025	First issue to Client	LSM	EVA	AMO

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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
1.0	28/07/2025	First draft	
2.0	01/08/2025	Client comments addressed, Accepted	Ref "6168_4-RR-02_UXO Factual Report_BNO_Rev1.0_CS_DNV_20250729"

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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)*
Geomines *Geomines (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
ALARP	As Low As Reasonably Practicable	Port	Portside
ASCII	American Standard Code for Information Interchange	QC	Quality Control
DTM	Digital Terrain Model	QINSy	Quality Integrated Navigation System
EGN	Empirical Gain Normalisation	QPS	Quality Positioning Services B.V.
EPSG	European Petroleum Survey Group	RGB	Red Green Blue
FMGT	Fledermaus Geocoder Toolbox	RX	Receiver
GNSS	Global Navigation Satellite System	Rev	Revision
GOVI	Geo Ocean VI	SHOM	Service Hydrographique et Oceanographique de la Marine
GRS80	Geodetic Reference System 1980	SSS	Side Scan Sonar
HF	High Frequency	SVS	Sound Velocity Sensor
HSE	Health, Safety and Environment	THU	Total Horizontal Uncertainty
HiPAP	High precision acoustic positioning	TVG	Time Varied Gain
IMU	Inertial Measurement Unit	TVU	Total Vertical Uncertainty
INS	Inertial Navigation System	UHR	Ultra-High Resolution
LAT	Lowest Astronomical Tide	UHRS	Ultra-High Resolution Seismic
LF	Low Frequency	USBL	Ultra-Short Baseline
MAG	Magnetometer	UTC	Universal Time Coordinated
MBES	Multibeam Echosounder	UTM	Universal Transverse Mercator
MRU	Motion Reference Unit	UXO	Unexploded Ordnance
OR	Operation Report	WGS84	World Geodetic System 1984
PBMA	Plus Basses Mers Astronomiques	ZDA	NMEA-0813 Date Time Message String (UTC, day, month, year, and local time zone offset)
PPS	Pulse per Second	ZH	Zero Hydrographic

REFERENCE DOCUMENTATION

GEOxyz Project Documents

Key project documentation created by GEOxyz is listed in table below.

Ref.	Document Number	Title	Owner
1.	6168_4-PDR-01	Project Document Register	GEOxyz
2.	6168_4-HSE-01	HSE Plan	GEOxyz
3.	6168_4-DDL-01	Data Deliverables List	GEOxyz
4.	6168_4-ERB-01	Emergency Response & Bridging Document	GEOxyz
5.	6168_4-PEP-01	Project Execution Plan	GEOxyz
6.	6168_4-PQP-01	Project Quality Plan	GEOxyz
7.	6168_4-PRA-01	Project Risk Assessment	GEOxyz
8.	6168_4-CM-01	Communication Matrix	GEOxyz

Standard Operating Procedures

Standard GEOxyz operating procedures that are relative to the project are listed in table below or reference.

Ref.	Document Number	Title	Owner
9.	GEO-OPP-6028	Positioning Systems Operation Procedure	GEOxyz
10.	GEO-OPP-6029	Heading Sensor Operation Procedure	GEOxyz
11.	GEO-OPP-6030	MRU Operation Procedure	GEOxyz
12.	GEO-OPP-6031	SVP Operation Procedure	GEOxyz
13.	GEO-OPP-6032	USBL Operation Procedure	GEOxyz
14.	GEO-OPP-6033	MBES Operation Procedure	GEOxyz
15.	GEO-OPP-6038	SSS Operation Procedure	GEOxyz
16.	GEO-OPP-3039	SBP Operation Procedure	GEOxyz
17.	GEO-OPP-6040	Magnetometer & Gradiometer Operation Procedure	GEOxyz
18.	GEO-OPP-6052	MBES Data Processing Procedure	GEOxyz
19.	GEO-OPP-6053	Magnetometer Data Processing Procedure	GEOxyz
20.	GEO-OPP-6054	SSS Data Processing Procedure	GEOxyz
21.	GEO-OPP-6055	SBP Data Processing Procedure	GEOxyz
22.	GEO-OPP-6109	UHRS Operation	GEOxyz

Project-specific Procedures

Project-specific procedures (PSPs) relevant to the project are listed in table below or reference.

Ref.	Document Number	Title	Owner
23.	GEO-G008-OPP-6011	L&R Procedure USBL Pole	GEOxyz
24.	GEO-G008-OPP-6033	L&R Procedure - Single TVG	GEOxyz
25.	GEO-G008-OPP-6003	L&R Procedure - SSS & Mag	GEOxyz
26.	GEO-G008-OPP-6001	L&R Procedure SVP	GEOxyz
27.		jncc-guidelines-seismicsurvey-aug2017-web	JNCC

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" were 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 1-1). The purpose of the contract is to carry out geophysical and UXO de-risking studies for approximately seven to eight sites spread throughout the metropolitan territory. This territory has been divided into four maritime façades:

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

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

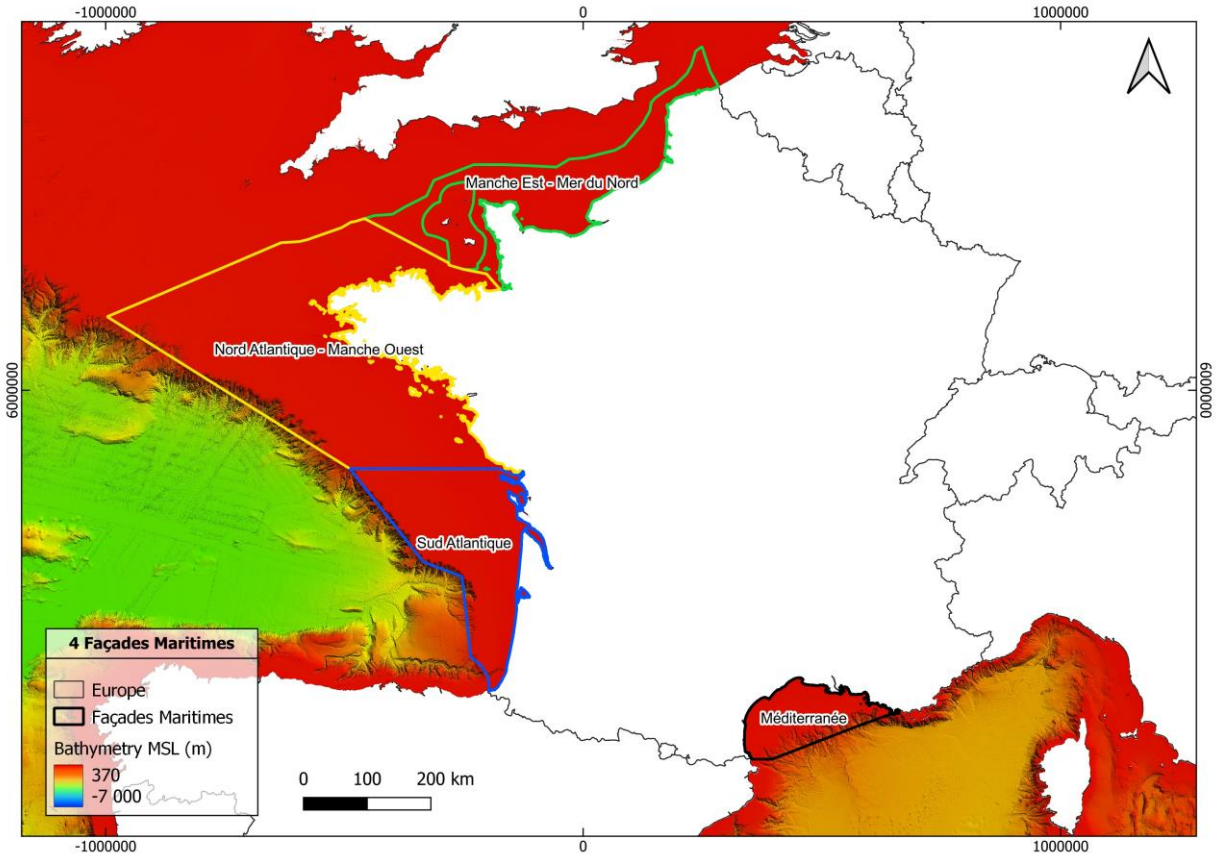


Figure 1-1: Project location overview - location of the four maritime facades

1.1.2 Objectives

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

- Provide UHR seismic, MBES bathymetry, and sub-bottom profiler high-quality data to better understand the surface and sub-surface conditions;
- Provide side-scan sonar and magnetometer data that were used to issue ALARP certificates prior to the completion of geotechnical testing.

1.2 SCOPE OF WORK

The overall scope of work consists of geophysical and UXO surveys in the Nord Atlantique Manche Ouest (BNO) zone as shown in Figure 1-2. An overview of the bathymetry of the work area is presented in Figure 1-3.

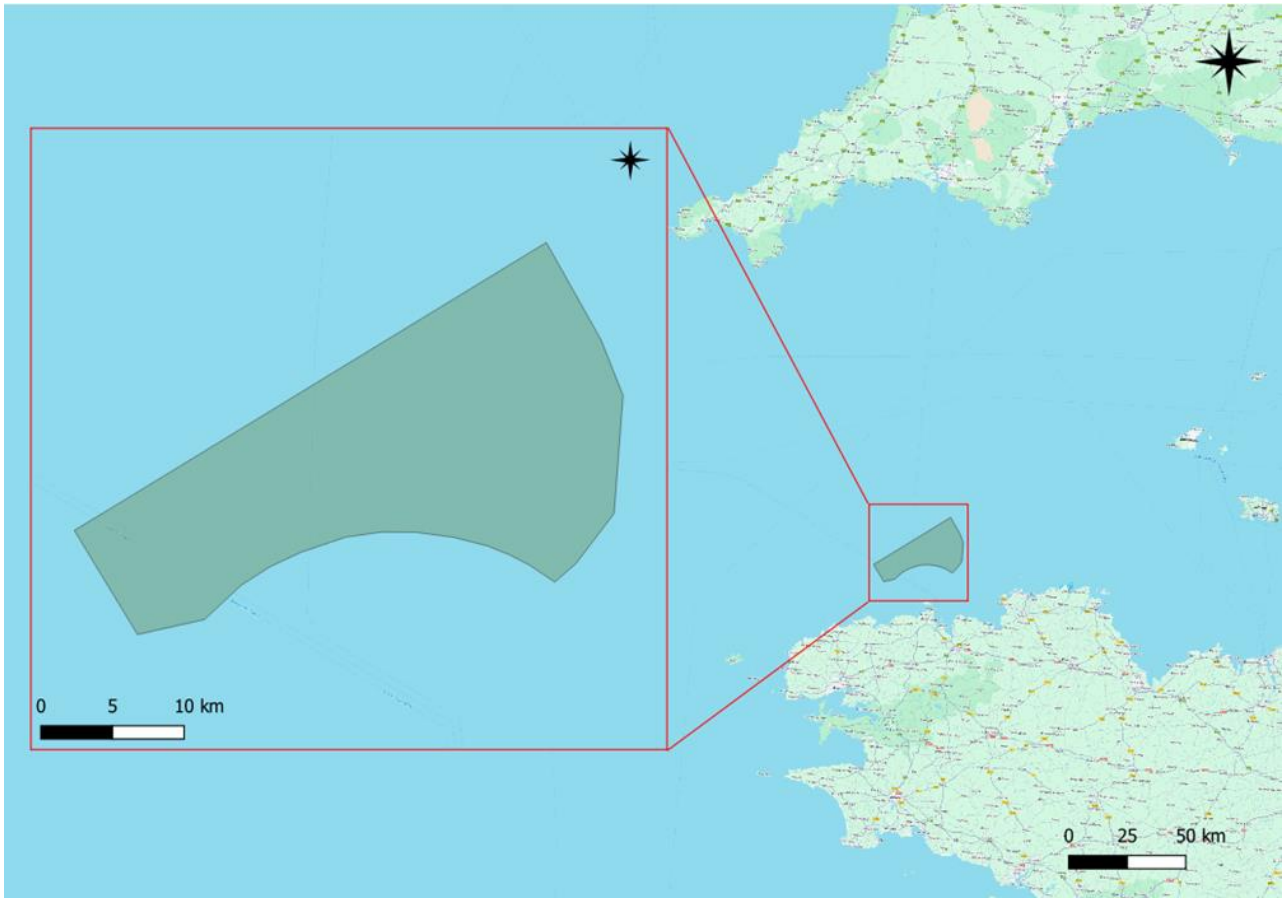


Figure 1-2: Scope of work area

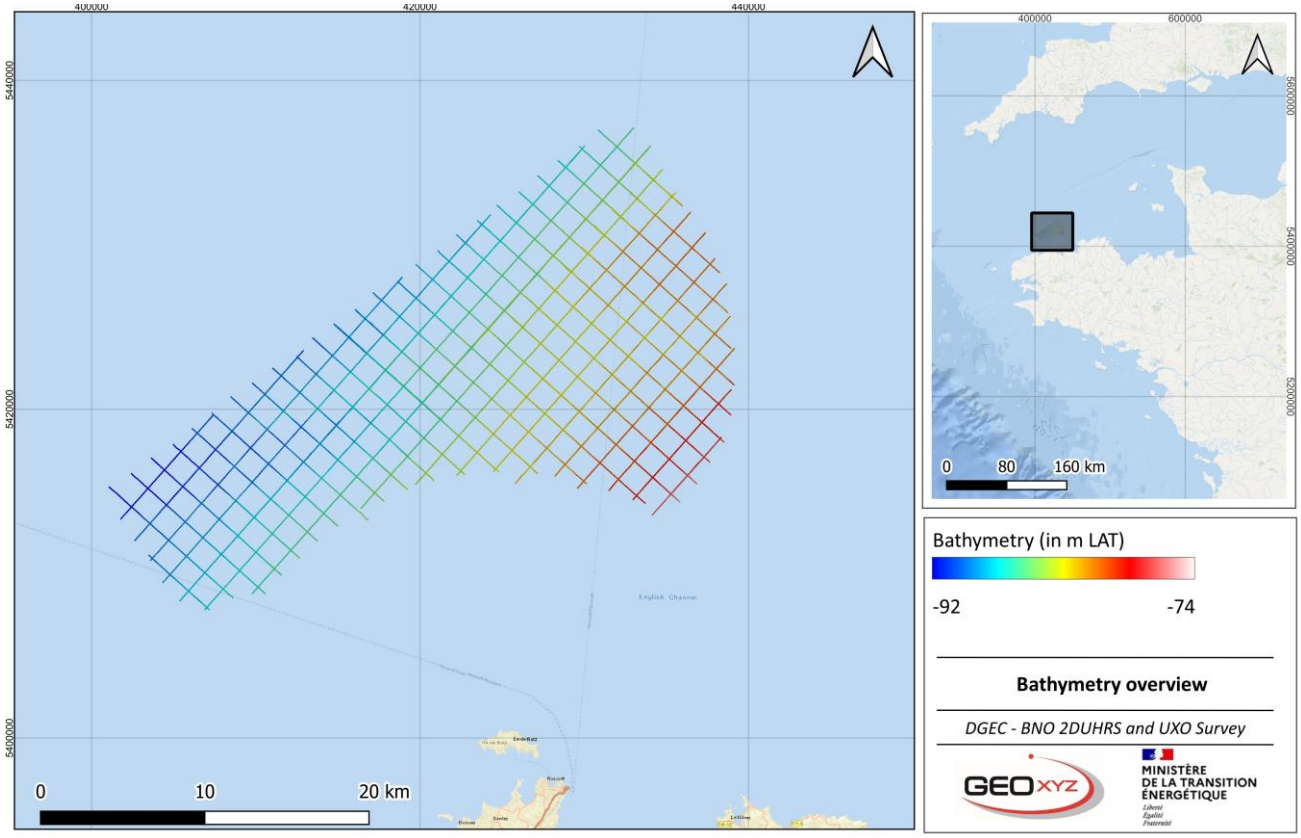


Figure 1-3: Bathymetry overview of the work area

The UXO survey comprised of the acquisition of magnetometer (MAG), multibeam bathymetry (MBES) and side scan sonar (SSS) sensor data. As far as possible, data from all sensors were acquired simultaneously, with line planning as per the client specifications.

Client specifications are for 30 m x 30 m ALARP areas however, UXO subcontractor requirements for ALARP certification require sufficient data on the edges of the boundary to allow for UXO migration. This results in the survey zone increasing to a 60 m x 60 m box. The ALARP certificates contain as minimum:

- A summary of the work conducted;
- 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. Some boxes have been

moved from the original location to issue the ALARP certificates. The original and the updated locations, as well as the distance between them are shown in Table 1-1.

Table 1-1: Original and updated ALARP box's locations

Name	Status	X centroid	Y centroid	Distance Original-Updated (m)
BNO_GI#01	Relocated	427075.41	5428214.65	21.55
BNO_GI#02	Relocated	437794.35	5426679.97	5.85
BNO_GI#03	Relocated	431214.16	5432685.07	142.50
BNO_GI#04	Relocated	426593.10	5418623.72	4.28
BNO_GI#05	Relocated	412760.00	5418881.03	24.09
BNO_GI#06	Relocated	415066.57	5416899.33	73.91
BNO_GI#07	Relocated	434030.29	5417960.64	2.66
BNO_GI#08	Relocated	414111.47	5413633.27	22.37
BNO_GI#09	Relocated	419145.82	5417223.48	0.18
BNO_GI#10	Relocated	411963.91	5415669.97	73.36
BNO_GI#11	Relocated	416830.35	5421238.50	52.64
BNO_GI#12	Relocated	421009.69	5423621.97	8.22
BNO_GI#13	Relocated	426181.23	5425026.68	28.42
BNO_GI#14	Relocated	429512.16	5421948.04	63.80
BNO_GI#15	Relocated	432315.04	5429579.27	6.13
BNO_GI#16	Relocated	433694.51	5424337.50	4.53
BNO_GI#17	Original	437034.35	5421322.95	0
BNO_GI#18	Original	436555.98	5429806.78	0
BNO_GI#19	Relocated	409659.35	5417656.67	4.32
BNO_GI#20	Relocated	422315.88	5418357.83	33.06

1.3 SCOPE OF DOCUMENT

Table 1-2 lists all the reports delivered as part of this survey, with this report highlighted in **bold**.

Table 1-2: Project reports

Document Number	Title
6168_4-OR-01	Operations Report - GOVI
6168_4-MCR-01	Mobilisation & Calibration Report - GOVI
6168_4-RR-01	UHRS Factual Report
6168_4-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 30N. All coordinates used are referenced to the geodetic datum and grid parameters listed in Table 2-1 and Table 2-2 below.

Table 2-1: 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 2-2: Projection parameters

Parameter	Details
EPSG Coordinate Reference Code	32630
Projection	UTM
Zone	30N
Central Meridian	3° West
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 reference which has been used is the Zéro Hydrographique (ZH) defined by the surface Lowest Astronomical Tide (LAT). Reduction was made via the SHOM Bathyelli (PBMA Plus Basses Mers Astronomiques in French) v2.1 model.

2.3 TIME AND LOG KEEPING

UTC (Universal Time Coordinated) 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. All data recorded in the online navigation software was 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 VESSELS

The specifications of the Geo Ocean IX (GOIX) vessel are summarised in Table 3-1.

Table 3-1: Survey vessel specifications

Geo Ocean IX		
	Owner:	GEOxyz
	Flag:	Luxembourg
	Length:	53.8 m
	Width:	13.0 m
	Draught:	4.8 m
	Maximum Speed:	11.5 knots
	Main Propulsion:	2 x Catapillar Diesel 1575 bhp
	Endurance:	24 h day operations (28 days)

3.2 EQUIPMENT

The equipment used for the survey is summarised in Table 3-2.

Table 3-2: 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
Sound Velocity Profiler	Valeport	Swift 500 x2 Mini SVS
USBL	Kongsberg HiPAP 352P	< 0.44 % of slant range
MBES	Kongsberg	EM2040 RX
Magnetometer	Geometric	G-882 Digital with Tritech PA500/6 altimeter
Sidescan Sonar	Edgetech	4205 / 300/600 kHz

3.3 SOFTWARE

The software that was used for data acquisition and processing is outlined in Table 3-3 below.

Table 3-3: Project software list

Equipment / Data Type	Acquisition	Processing
Navigation, MBES, GNSS	QPS QINSy	QPS QINSy v9.6.4
MBES	QPS QINSy	BeamworX AutoClean 2024.1.1.3 Qimera v2.6.3
SSS	Edgetech Discover	SonarWiz v7.10.2
TVG	QINSy	Oasis Montaj 2024.2
Passive Acoustic Monitoring (PAM)	Subacoustech, 4 broadband elements (up to 250 khz) with PAMGuard (plus spare system)	n/a

4 OPERATIONAL SUMMARY

The survey vessel Geo Ocean IX (GOIX) was utilised to complete the MBES/SSS/MAG acquisition during the UXO survey. A summary of the survey operations is outlined in Table 4-1.

Table 4-1: Overview of survey operations

Vessel	Dates	Activity
Geo Ocean IX	22/05/2025 – 16/06/2025	MBES/SSS/MAG UXO survey, transit etc.

5 DATA PROCESSING

5.1 MULTIBEAM ECHOSOUNDER

5.1.1 Data acquisition and settings

The primary settings used for the project are outlined in Table 5-1. The number of lines acquired per trackplot were 86.

Table 5-1: MBES acquisition parameters

Item	Setting
Survey speed:	~4 knots
Steered node:	No
Beam Spacing:	Equi-distant
Soundings-per-ping:	1024 per head
Swath Opening Angles[1]:	10 m = 135-140°
System Frequency:	400 kHz
Coverage:	Full coverage bathymetry with 30 % data overlap
Back Scatter Data Required:	Yes (logged but not processed)
Water Column Data to be Recorded:	No
Line Spacing:	See line plan

The MBES project specifications are listed in Table 5-2.

Table 5-2: MBES specifications

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

[1] Proposed swath is the estimate that was used in the tender phase to check coverage/data density requirements. It may be necessary to adjust this in the field depending on local conditions (whilst still ensuring the required specifications are met).

5.1.2 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 5-1 outlines the general MBES processing workflow.

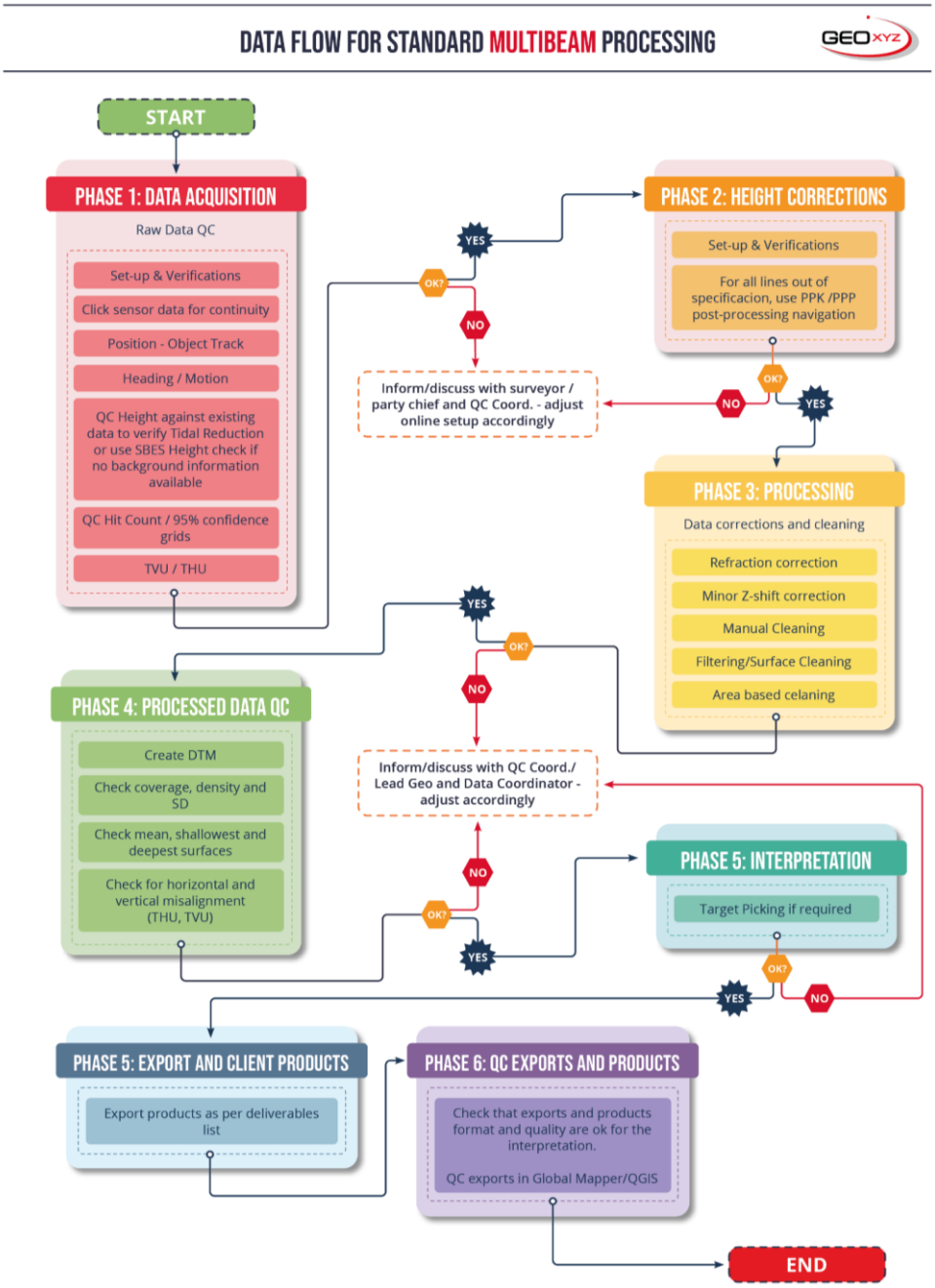


Figure 5-1: MBES processing workflow

5.1.3 Data quality assessment

For MBES data 69 lines have been acquired with run-in/run out length of 150 metres. The data was of high quality with very little acoustic noise. An example of the number of hits per meter over the required survey areas are described below and illustrated in Figure 5-2. Seabed morphology was well defined in the processed Digital Terrain Models (DTMs).

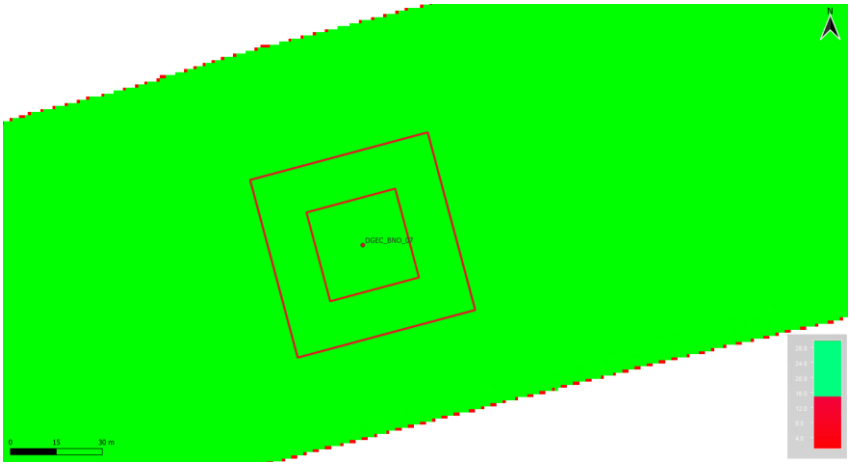


Figure 5-2: BNO GI07 Bathymetric Data Hit Count per 1 m square (green is > 15 hits per bin, red is <15 hits per bin)

The THU (Total Horizontal Uncertainty) and TVU (Total Vertical Uncertainty) values calculated for each box are presented in Table 5-3. These values have been calculated according to the IHO S44 Special Order threshold. TVU has been calculated according 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 metres.

Table 5-3: THU and TVU values

BNO UXO	Depth min	Depth max	Depth Mean	IHO TVU calculated	IHO THU calculated	TVU in block	THU in block
Box GI01	85.34	85.61	85.475	0.81	2	0.22-0.24	0.82-0.94
Box GI02	80.34	80.8	80.57	0.78	2	0.22-0.24	0.79-0.91
Box GI03	84.62	84.93	84.775	0.81	2	0.22-0.24	0.82-0.94
Box GI04	82.88	83.19	83.035	0.80	2	0.22-0.25	0.81-0.92
Box GI05	89.57	90.08	89.825	0.84	2	0.22-0.25	0.86-0.97
Box GI06	87.29	87.89	87.59	0.83	2	0.22-0.24	0.84-0.93
Box GI07	79.83	80.19	80.01	0.78	2	0.22-0.25	0.79-0.9
Box GI08	85.94	86.26	86.1	0.82	2	0.22-0.24	0.83-0.94
Box GI09	85.99	86.3	86.145	0.82	2	0.22-0.25	0.84-0.94
Box GI10	88.06	88.29	88.175	0.83	2	0.22-0.25	0.84-0.96

BNO UXO	Depth min	Depth max	Depth Mean	IHO TVU calculated	IHO THU calculated	TVU in block	THU in block
Box GI11	86.69	87.22	86.955	0.82	2	0.22-0.25	0.83-0.95
Box GI12	85.4	85.81	85.605	0.81	2	0.22-0.25	0.82-0.95
Box GI13	83.39	83.74	83.565	0.80	2	0.22-0.24	0.8-0.92
Box GI14	83.04	83.32	83.18	0.80	2	0.22-0.24	0.8-0.9
Box GI15	81.17	81.47	81.32	0.79	2	0.22-0.24	0.78-0.9
Box GI16	82.42	82.71	82.565	0.80	2	0.22-0.25	0.79-0.92
Box GI17	80.39	80.59	80.49	0.78	2	0.22-0.25	0.77-0.88
Box GI18	79.81	80.03	79.92	0.78	2	0.22-0.24	0.77-0.9
Box GI19	90.56	90.88	90.72	0.84	2	0.22-0.25	0.87-0.99
Box GI20	84.13	84.3	84.215	0.81	2	0.22-0.24	0.81-0.93

5.1.4 MBES deliverables

The MBES deliverables created as a result of the project are outlined in Table 5-4.

Table 5-4: Overview of the MBES deliverables

Deliverable	Format
RAW bathymetric data	QPD or bwxraw
De-spiked, 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 standard deviation (95% confidence) values gridded surface	ASCII, RGB TIF, Encoded TIF or FLT
Bathymetric Total Horizontal Uncertainty values gridded surface	ASCII, Encoded TIF (LZW)
Bathymetric Total Vertical Uncertainty values gridded surface	ASCII, Encoded TIF (LZW)
Bathymetric slope values gridded surface	RGB TIF, Encoded TIF or FLT
Bathymetric Contour Lines	SHP
MB Targetlist	ASCII, SHP

5.2 SIDE SCAN SONAR

5.2.1 Data acquisition and settings

For side scan sonar data acquisition, the acquisition parameters are listed in Table 5-5. The number of lines acquired per trackplot were 101.

Table 5-5: SSS acquisition parameters

Item	Setting
Survey speed:	~4 knots
Steered node:	Yes

Item	Setting
Frequency:	Dual frequency with the high frequency of at least 600 kHz
Range:	20 m range for both LF and HF
Mode:	HDM
Flying Altitude:	5-10 % of range
Time Stamp:	ZDA from QINSy
Navigation:	USBL position / fixed layback
Heading:	Internal compass / bearing to tow point / determined from positioning verification
Nadir Filler:	No
Data Format:	JSF / XTF
Line spacing:	8 m

5.2.2 Overview of the methodology

Side scan sonar data (.JSF files) was recorded using Edgetech Discover. An acquisition log was kept of all settings and other observations. Quality Control (QC) was performed offline where the dataset is checked for overall quality, coverage, artefacts, and positioning.

The HF and LF SSS data were processed using the Chesapeake SonarWiz software following the workflow outlined in Figure 5-3.

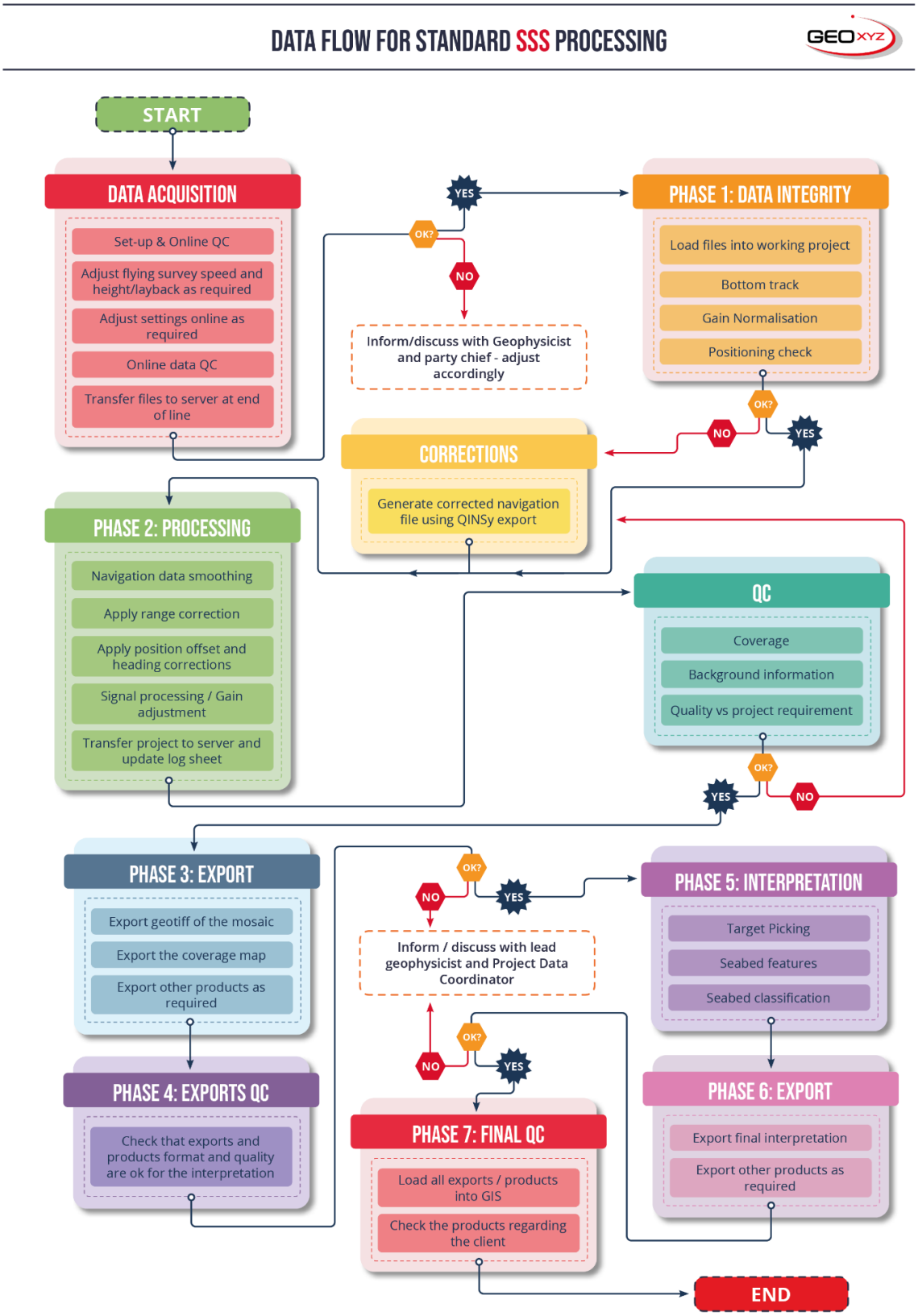


Figure 5-3: SSS processing workflow

Navigation data from the QINSy logfile was injected into the sonar files using Nav Injector Pro, the heading used was a calculated bearing-to-towpoint from QINSy and the X and Y co-ordinates were Kalman filtered to provide the most accurate positioning of the SSS fish. 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 using Zedit. 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.

5.2.3 Data quality assessment

For SSS data 72 lines have been acquired with run-in/run out length of 150 metres. The data was of high quality, with no environmental artefacts (e.g., pitch effects, thermoclines, etc.). Despite the presence of currents, SSS positioning remained accurate and within the 2 m tolerance allowed for this project. The high definition of the data enabled the identification of targets as small as 0.5 m. Boulder fields were identified in some boxes, causing the reallocation of those boxes to avoid as many boulders as possible.

An example of data quality and observed boulder field is presented in Figure 5-4.

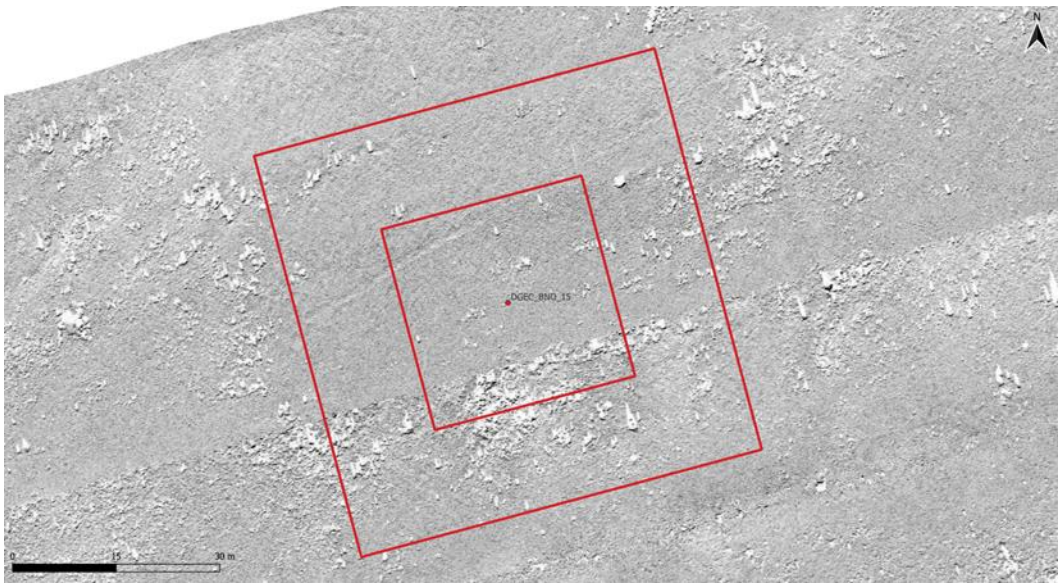


Figure 5-4: SSS mosaic along Box BNO GI15

5.2.4 SSS deliverables

The SSS deliverables created as a result of the project are outlined in Table 5-6.

Table 5-6: Overview of the SSS deliverables

Deliverable	Format
Raw SSS data	JSF, HF XTF
Processed SSS data	HF XTF
SSS Individual mosaic per line	RGB TIF
SSS mosaic	RGB TIF
SSS Targetlist	ASCII, Excel

Deliverable	Format
Seabed Features, Lines, Polygons	SHP
Seabed Sediments Primary	SHP

5.3 MAGNETOMETER

5.3.1 Data acquisition and settings

Magnetometer data was acquired following specifications listed in Table 5-7 below.

The original line plan for the run-in/run-out length of the UXO surveys was 52 m, but it was extended 100 m each side to acquire more data in case the original boxes contained any pUXO and box relocation was requested. This involved increasing the line lengths to 250 m to provide an adequate alternative clearance area. Number of MAG lines acquired were 330.

To calibrate MAG data, surrogate item of 25 kg ferrous magnetic object was used. This type of item has been selected, as according to previous studies, the smallest possible UXO threat would be 26 kg in size, so this allows for threat this size to be discovered.

Table 5-7: Magnetometer system settings

General parameters	
System type	TVG frame & 2 x Geometrics G882 (soft towed) x 2
Survey speed	4.2 knots
Positioning	HiPAP 351 USBL
Magnetometer altitude	2.0 m – 3.5 m
Frequency	10 Hz

The MAG project specifications are listed in Table 5-8.

Table 5-8: Magnetometer specifications

Item	Specification
Minimum sampling rate	10 Hz
Max towing altitude	4 m
Operating range	20 000 to 100 000 Nanoteslas (nT)
Counter sensitivity	<0.004 nT/pHz rms
Gaps	<5 m length by 3 m in width

5.3.2 Overview of the methodology

The processing and target selection involved several steps:

- Manual or filter-based removal of spikes in MAG data.
- Smooth navigation using a median filter of 50 values, with manual removal of spikes if necessary.
- Calculation of the background field using a set of standard NL-filters: starting from 30 fiducials width and a tolerance of 0.5 nT to a window width of 2 fiducials and a tolerance of 0.0375 nT.
- Residual calculation by subtracting the background.
- Refining anomalies on the profiles.

- Selection of all targets above the 3 nT peak-to-peak threshold.
- Target characteristics determined by the minimum to maximum on the residual signal, zero crossing for in-line width, and type based on residual (negative monopole, positive monopole, dipole).

To minimize geological influences, the geological background value was considered and removed where possible within the limited window used for total field value background calculation. The workflow specified that a non-linear filter that should eliminate most large-scale geological effects. Short-wave geological signals (<40 m) were significantly reduced from the target list based on the magnetic target threshold. Larger (suspected) geological targets were included in the list, referencing 'potential geology' in the comment section.

The quality of the magnetic data was influenced by weather conditions, with higher swells contributing to increased noise. Efforts were made to keep this noise below 2 nT. Lines displaying excessive noise were flagged for rejection and a potential re-run.

Figure 5-5 outlines the magnetometer processing workflow.

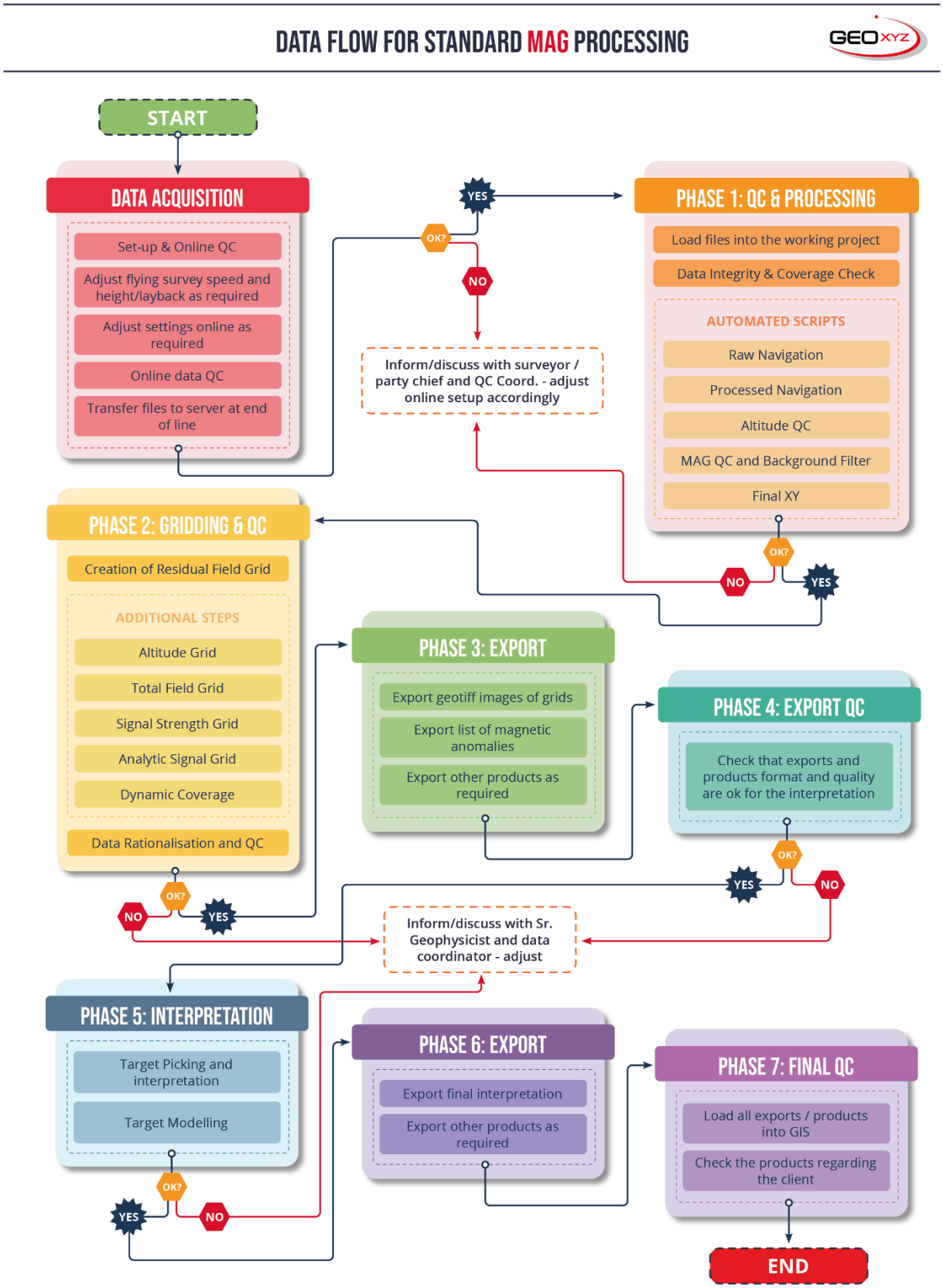


Figure 5-5: MAG processing workflow

5.3.3 Data quality assessment

For MAG data 234 lines have been acquired with run-in/run out length of 150 metres. Magnetometer data quality was good overall. When necessary, the line was fully rejected. Altitude was quite stable and mainly within 1 and 4 m. As dynamic coverage has been used, very few infills have been necessary to cover the boxes. Some anomalies were seen inside and in the surroundings of the boxes leading to the reallocation of almost all boxes.

The MAG position could not be verified during the EVT, as the surrogate was not detected on the SSS and MBES. However constant monitoring was performed during the acquisition, a contact has been identified on all three sensors confirming that the position was good and within the project tolerance of 2 m (Figure 5-6).

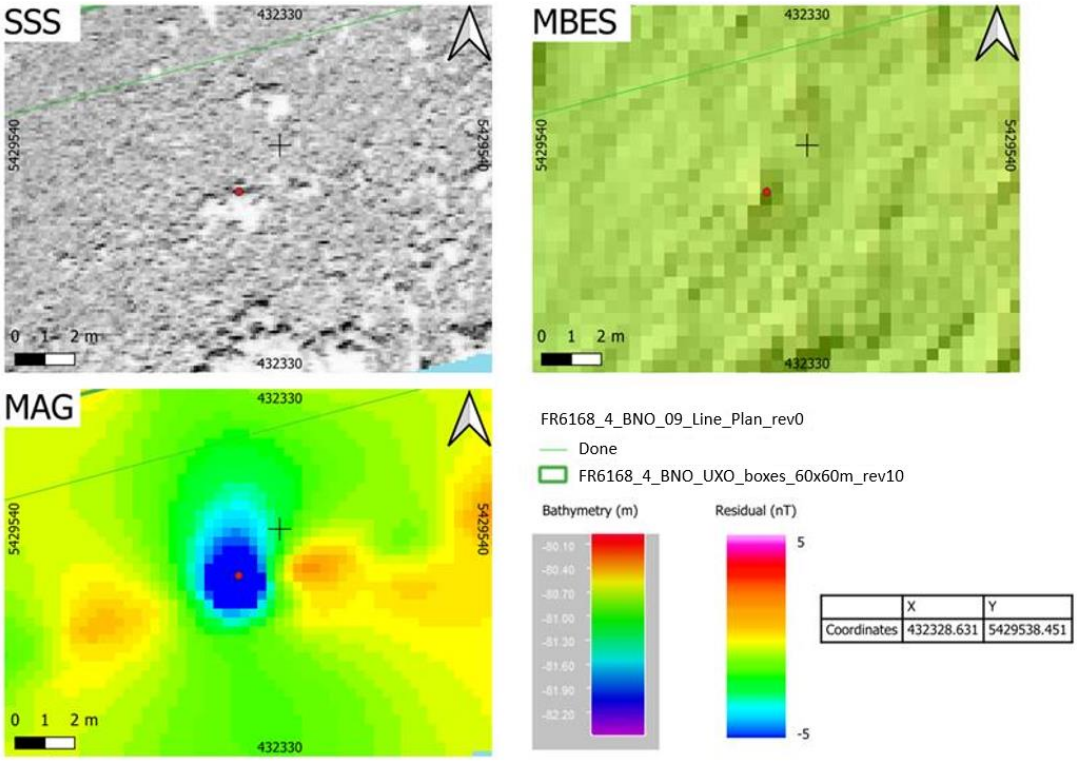


Figure 5-6: Example of position accuracy within all sensors

An example of the residual data quality is displayed in Figure 5-7.

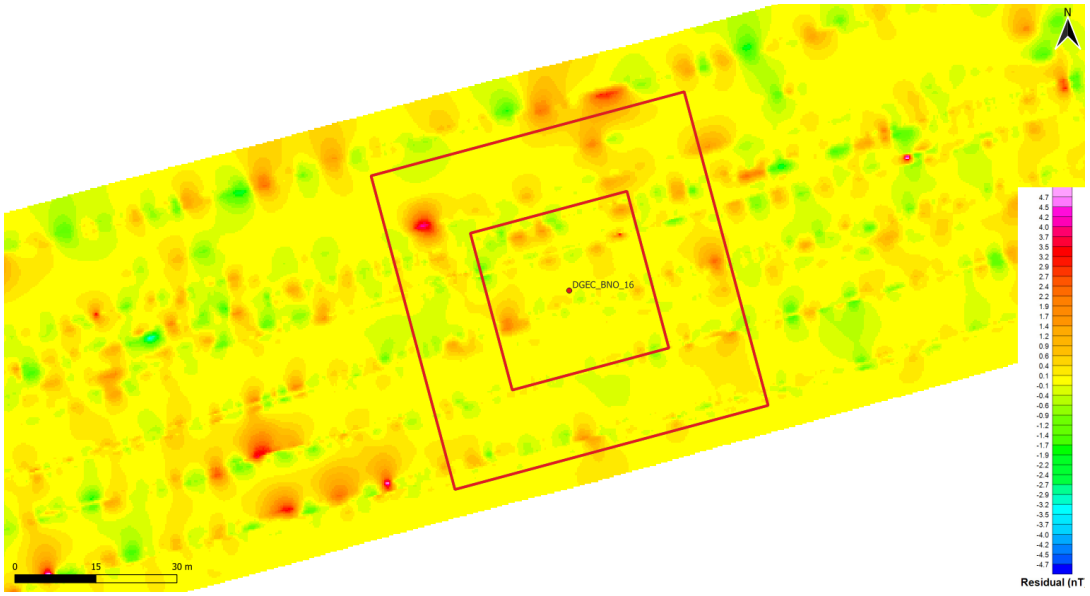


Figure 5-7: Example of residual data along GNO GI16 box

5.3.4 MAG deliverables

The MAG deliverables created as a result of the project are outlined in Table 5-9.

Table 5-9: Overview of the MAG deliverables

Deliverable	Format
RAW magnetometric data	ASCII
Processed magnetometric data	ASCII
Altitude Grid	ENCODED TIF OR FLT, RGB TIF
Signal Strength Grid	ENCODED TIF OR FLT, RGB TIF
Total Field Grid	ENCODED TIF OR FLT, RGB TIF
Residual Signal Grid	ENCODED TIF OR FLT, RGB TIF
Analytic Signal Grid	ENCODED TIF OR FLT, RGB TIF
MAG Targetlist	ASCII, SHP, Excel

6 RESULTS

6.1 OVERVIEW

The results of the survey per ALARP geotechnical box have been presented in APPENDIX A. These boxes comprise an area of 30 x 30 metres. Each of the charts in the appendix contains a bathymetric overview with targets, seabed sediment classification, HF side scan mosaic with features and targets, residual MAG grid and the location of the shown ALARP geotechnical box.

There were 478 targets detected in total. Out of those, 22 were detected as MBES target, 455 as SSS targets and one target was detected on MAG dataset.

ALARP certificates were issued for this survey and can be found attached to this report (APPENDIX B).

6.2 BATHYMETRY

The bathymetric data was acquired in a 30-centimetre 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 within a few metres.

The deepest point of the surveyed boxes is located in the BNO_GI#19, lying at a depth of -90.88 m LAT. The shallowest point is located in the BNO_GI#18, lying at a depth of -79.81 m LAT.

6.3 SEABED SEDIMENTS AND MORPHOLOGY

In terms of sedimentation, only sand was present. Top-right chartlet in APPENDIX A shows the sedimentation classification of each surveyed box.

In total, 23 seabed features were noted: 18 high density boulder fields, one sand ripple and four medium density boulder field. Their number and distribution are shown in Table 6-1, while their exact location is shown in on the lower-left chartlet in APPENDIX A.

Table 6-1: Number and distribution of seabed features

BNO UXO box	Number of polygonal seabed features		
	Medium density boulder field	High density boulder field	Ripples
BNO_GI#01	0	0	1
BNO_GI#02	0	1	0
BNO_GI#03	0	2	0
BNO_GI#04	1	0	0
BNO_GI#05	0	1	0
BNO_GI#06	0	1	0
BNO_GI#07	0	1	0
BNO_GI#08	1	0	0
BNO_GI#09	0	2	0

BNO UXO box	Number of polygonal seabed features		
	Medium density boulder field	High density boulder field	Ripples
BNO_GI#10	0	1	0
BNO_GI#11	0	1	0
BNO_GI#12	0	2	0
BNO_GI#13	0	0	0
BNO_GI#14	1	0	0
BNO_GI#15	0	1	0
BNO_GI#16	0	1	0
BNO_GI#17	0	1	0
BNO_GI#18	0	1	0
BNO_GI#19	1	2	0
BNO_GI#20	0	1	0

6.4 CONTACTS AND DEBRIS

There were 419 targets detected in total. Out of those, 22 were detected as MBES target, 396 as SSS targets and one target was detected on MAG dataset.

Their number and distribution are shown in Table 6-2, while their exact location is shown in on the upper-left and lower-left chartlet in APPENDIX A.

Table 6-2: Number and distribution of MBES, SSS and MAG targets

BNO UXO box	Number of SSS targets	Number of MBES targets	Number of MAG targets
	Boulder	Boulder	Dipole
BNO_GI#01	7	0	0
BNO_GI#02	37	0	0
BNO_GI#03	18	0	0
BNO_GI#04	12	0	0
BNO_GI#05	12	4	0
BNO_GI#06	20	2	0
BNO_GI#07	4	0	0
BNO_GI#08	6	0	0
BNO_GI#09	23	0	0
BNO_GI#10	23	2	0
BNO_GI#11	44	0	0
BNO_GI#12	25	6	0
BNO_GI#13	1	0	0
BNO_GI#14	29	4	0

BNO UXO box	Number of SSS targets	Number of MBES targets	Number of MAG targets
	Boulder	Boulder	Dipole
BNO_GI#15	14	1	0
BNO_GI#16	15	2	0
BNO_GI#17	52	0	0
BNO_GI#18	30	1	1
BNO_GI#19	9	0	0
BNO_GI#20	15	0	0

7 CONCLUSION

A UXO survey was conducted for twenty 30 x 30-metre survey boxes within the BNO area. The survey comprised the acquisition of multibeam bathymetry (MBES), side scan sonar (SSS) and magnetometer (MAG) data. The survey vessel Geo Ocean IX (GOIX) was utilised for the acquisition. The survey was conducted between 22/05/2025 and 16/06/2025. ALARP certificates were issued on 26/06/2025.

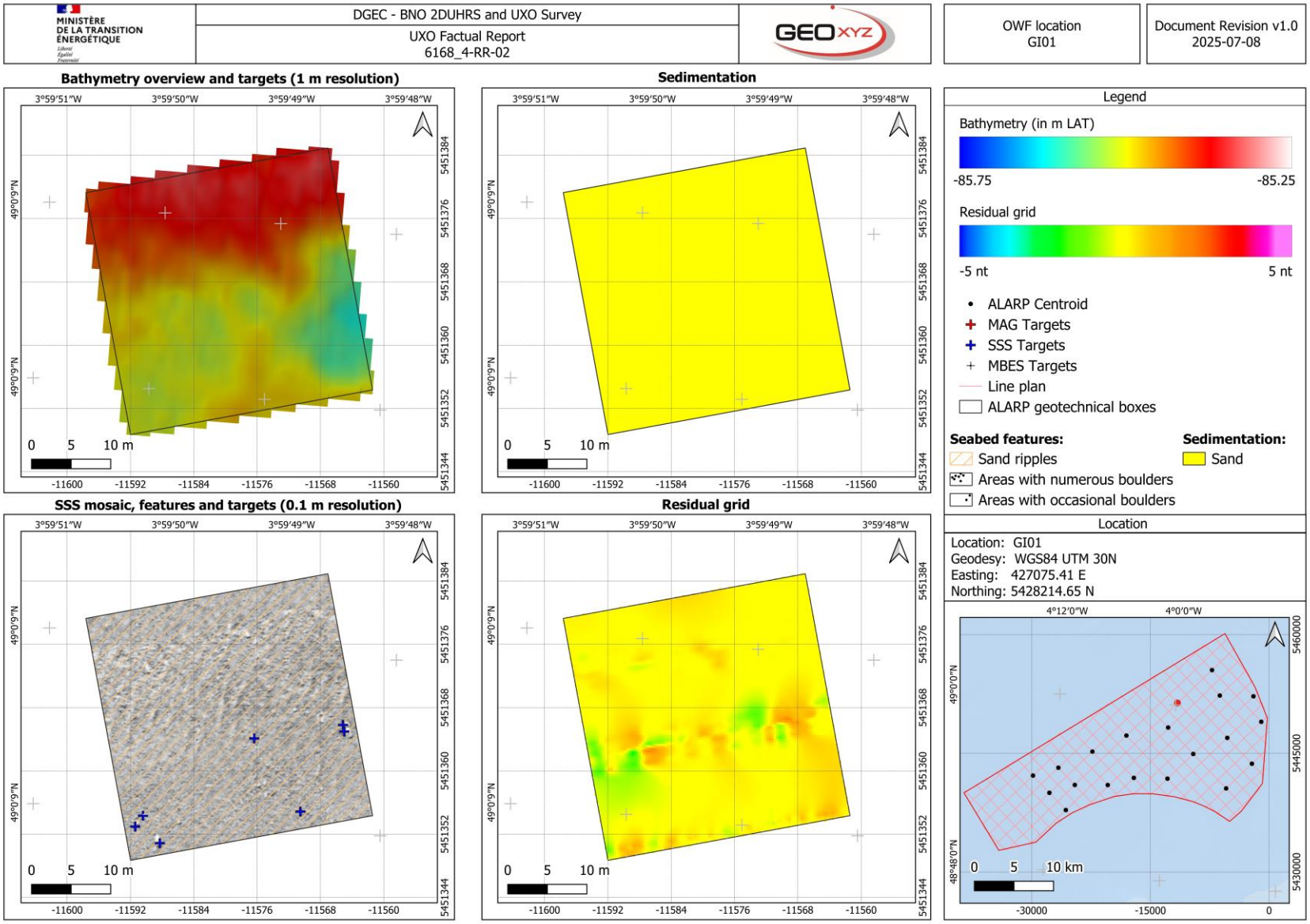
The bathymetry within each of the survey boxes vary within a few metres. The deepest point of the surveyed boxes is located in the BNO_GI#19, lying at a depth of -90.88 m LAT. The shallowest point is located in the BNO_GI#18, lying at a depth of -79.81 m LAT.

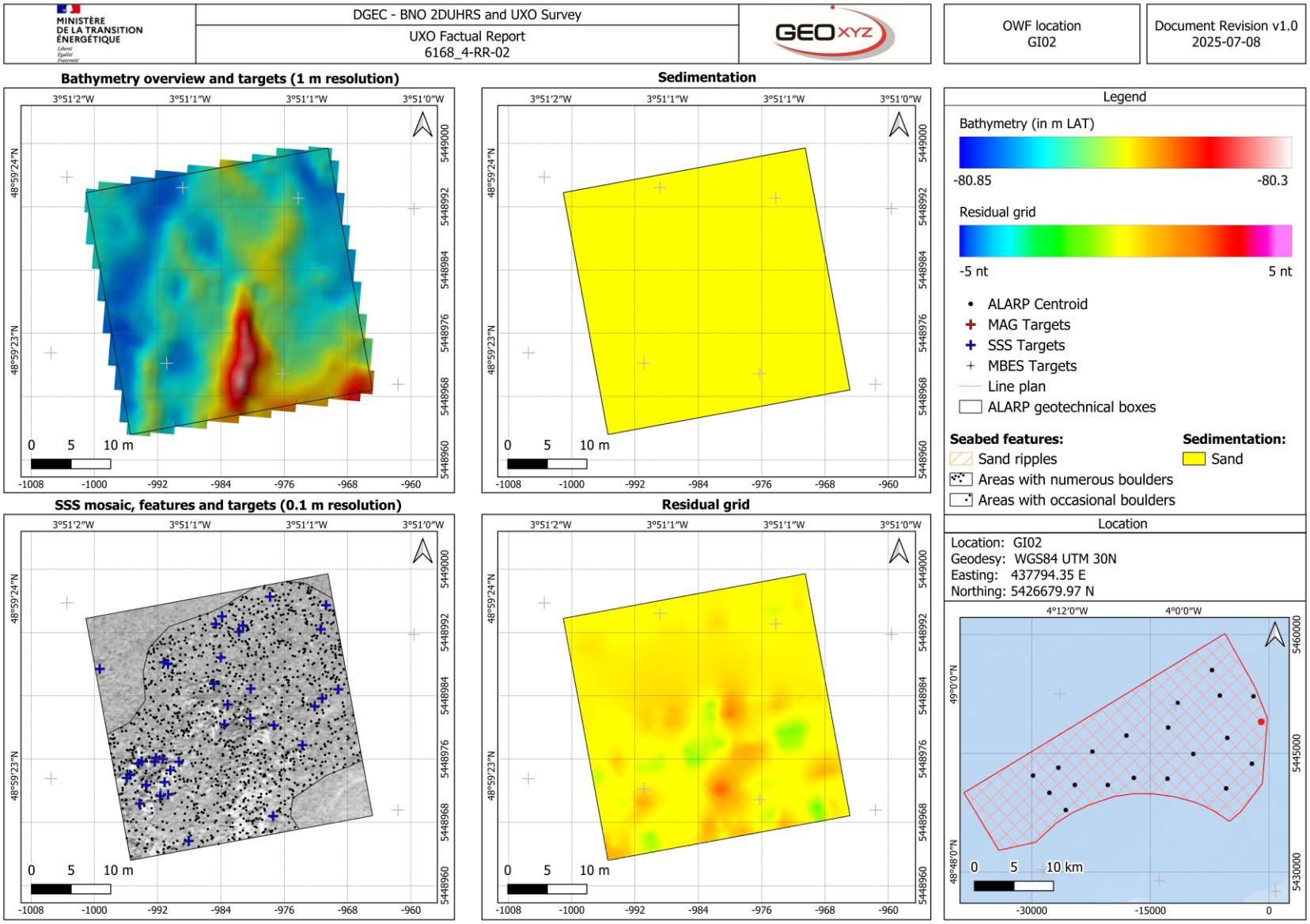
Sand was the only type of sedimentation present.

In total, 23 seabed features were noted: 18 high density boulder fields, one sand ripple and four medium density boulder field.

There were 419 targets detected in total. Out of those 22 were detected as MBES target, 396 as SSS targets and one target was detected on MAG dataset.

APPENDIX A. BNO UXO BOX CHARTS


MINISTÈRE DE LA TRANSITION ÉNERGÉTIQUE
DGEC - BNO 2DUHRS and UXO Survey
UXO Factual Report
6168_4-RR-02
OWF location
GI01
Document Revision v1.0
2025-07-08
Bathymetry overview and targets (1 m resolution)
Sedimentation
SSS mosaic, features and targets (0.1 m resolution)
Residual grid
Legend
Bathymetry (in m LAT)
-85.75
-85.25
Residual grid
-5 nt
5 nt
ALARP Centroid
MAG Targets
SSS Targets
MBES Targets
Line plan
ALARP geotechnical boxes
Seabed features:
Sand ripples
Areas with numerous boulders
Areas with occasional boulders
Sedimentation:
Sand
Location
Location: GI01
Geodesy: WGS84 UTM 30N
Easting: 427075.41 E
Northing: 5428214.65 N
0 5 10 m
0 5 10 km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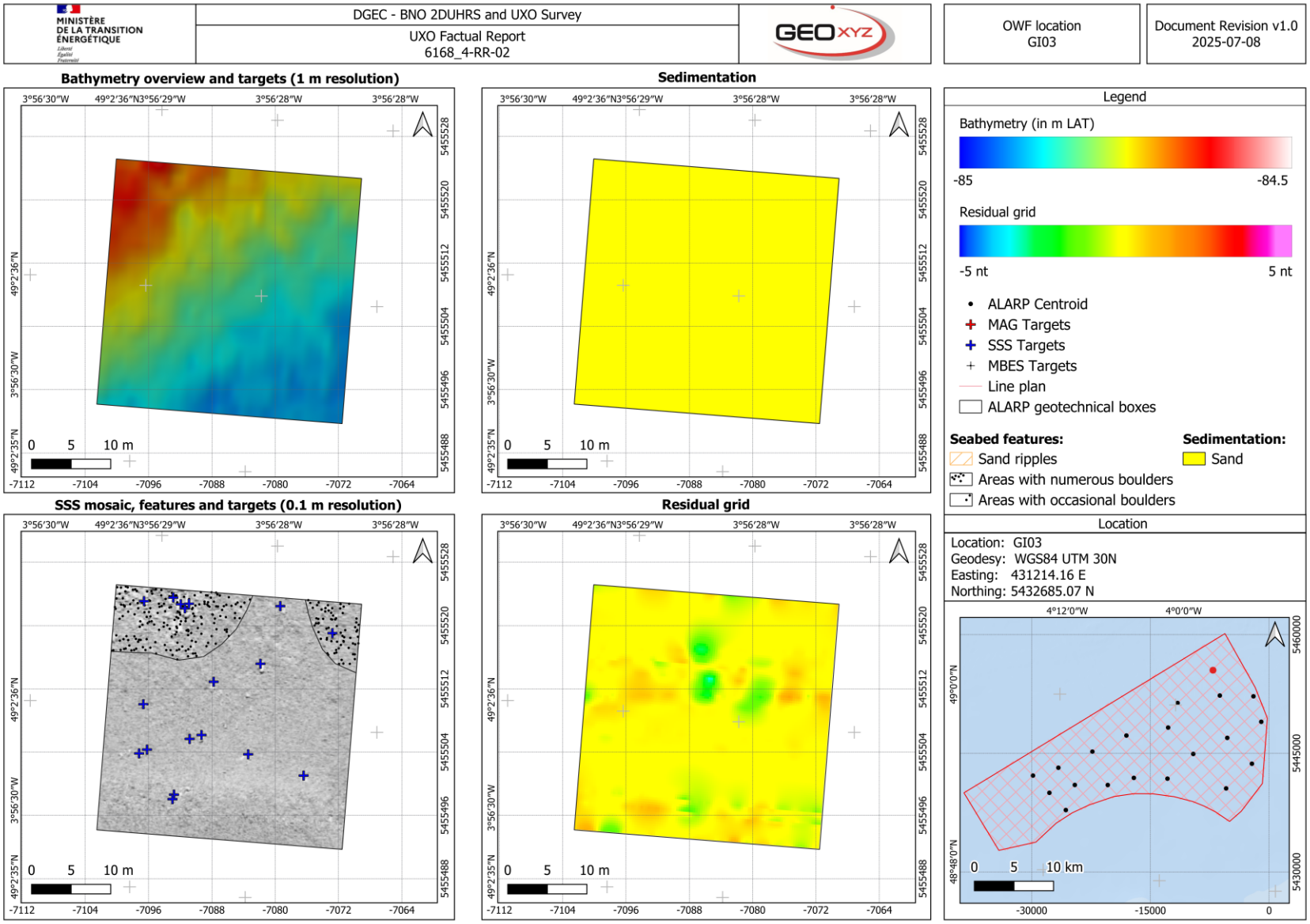
DGEC - BNO 2DUHRS and UXO Survey
UXO Factual Report
6168_4-RR-02
OWF location
GI02
Document Revision v1.0
2025-07-08
Bathymetry overview and targets (1 m resolution)
Sedimentation
SSS mosaic, features and targets (0.1 m resolution)
Residual grid
Legend
Bathymetry (in m LAT)
-80.85
-80.3
Residual grid
-5 nt
5 nt
ALARP Centroid
MAG Targets
SSS Targets
MBES Targets
Line plan
ALARP geotechnical boxes
Seabed features:
Sand ripples
Areas with numerous boulders
Areas with occasional boulders
Sedimentation:
Sand
Location
Location: GI02
Geodesy: WGS84 UTM 30N
Easting: 437794.35 E
Northing: 5426679.97 N
0 5 10 m
0 5 10 km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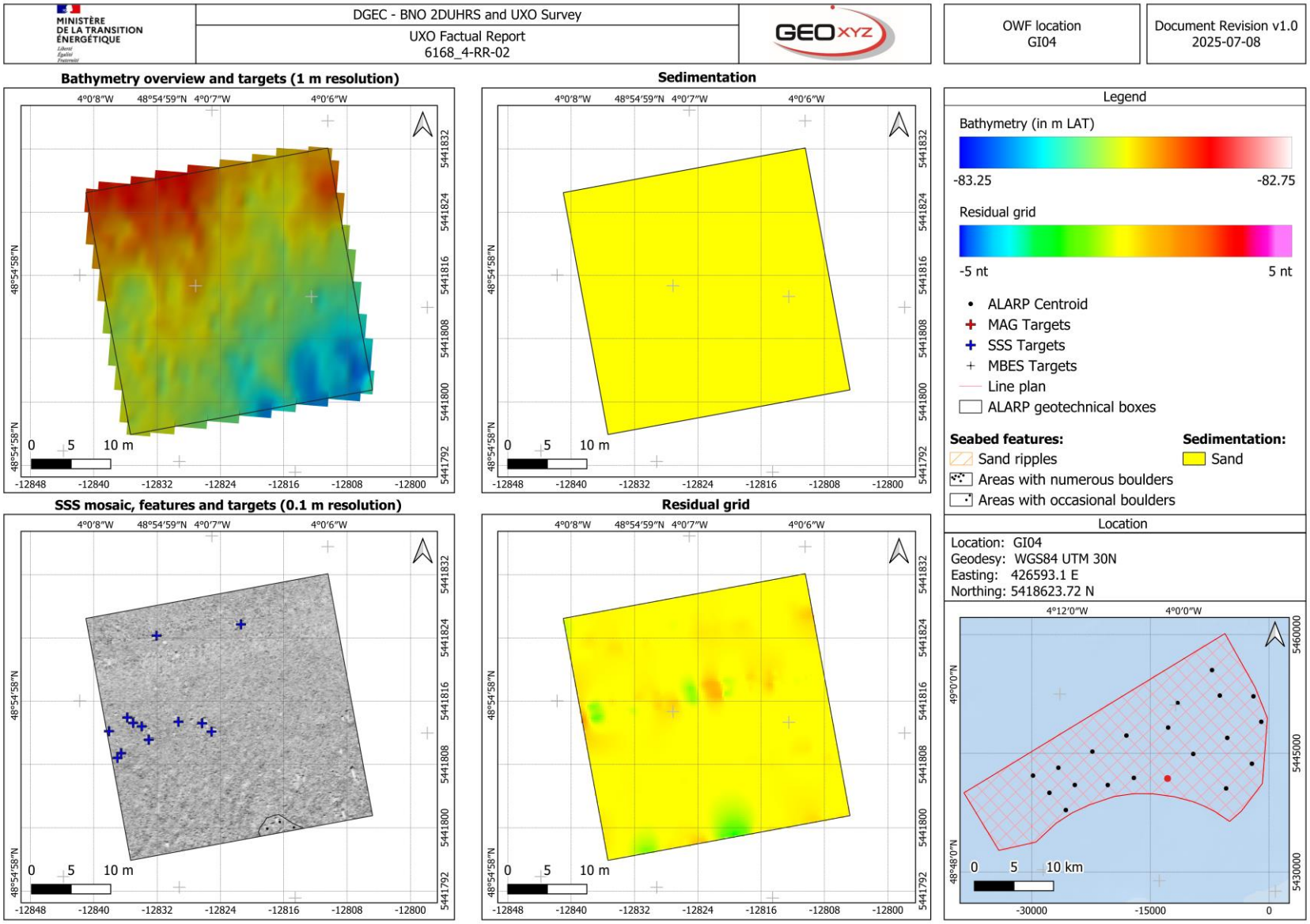
DGEC - BNO 2DUHRS and UXO Survey
UXO Factual Report
6168_4-RR-02
OWF location
GI03
Document Revision v1.0
2025-07-08
Bathymetry overview and targets (1 m resolution)
Sedimentation
SSS mosaic, features and targets (0.1 m resolution)
Residual grid
3°56'30"W
49°2'36"N3°56'29"W
3°56'28"W
49°2'36"N
49°2'35"N
5455528
5455520
5455512
5455504
5455496
5455488
-7112
-7104
-7096
-7088
-7080
-7072
-7064
0 5 10 m
Legend
Bathymetry (in m LAT)
-85
-84.5
Residual grid
-5 nt
5 nt
ALARP Centroid
MAG Targets
SSS Targets
MBES Targets
Line plan
ALARP geotechnical boxes
Seabed features:
Sand ripples
Areas with numerous boulders
Areas with occasional boulders
Sedimentation:
Sand
Location
Location: GI03
Geodesy: WGS84 UTM 30N
Easting: 431214.16 E
Northing: 5432685.07 N
4°12'0"W
4°0'0"W
49°0'0"N
48°48'0"N
5460000
5445000
5430000
0 5 10 km
-30000
-15000
0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DGEC - BNO 2DUHRS and UXO Survey
UXO Factual Report
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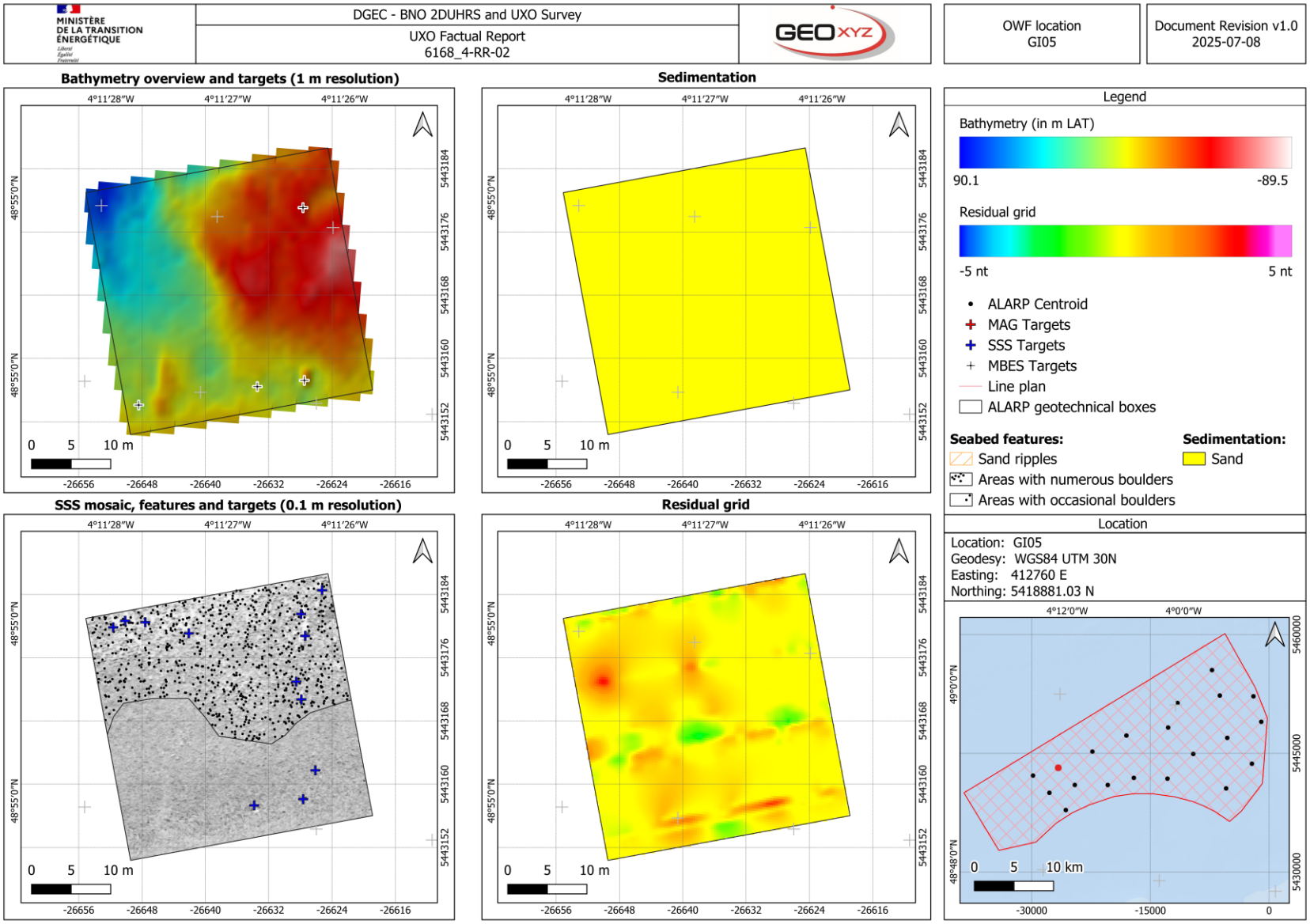
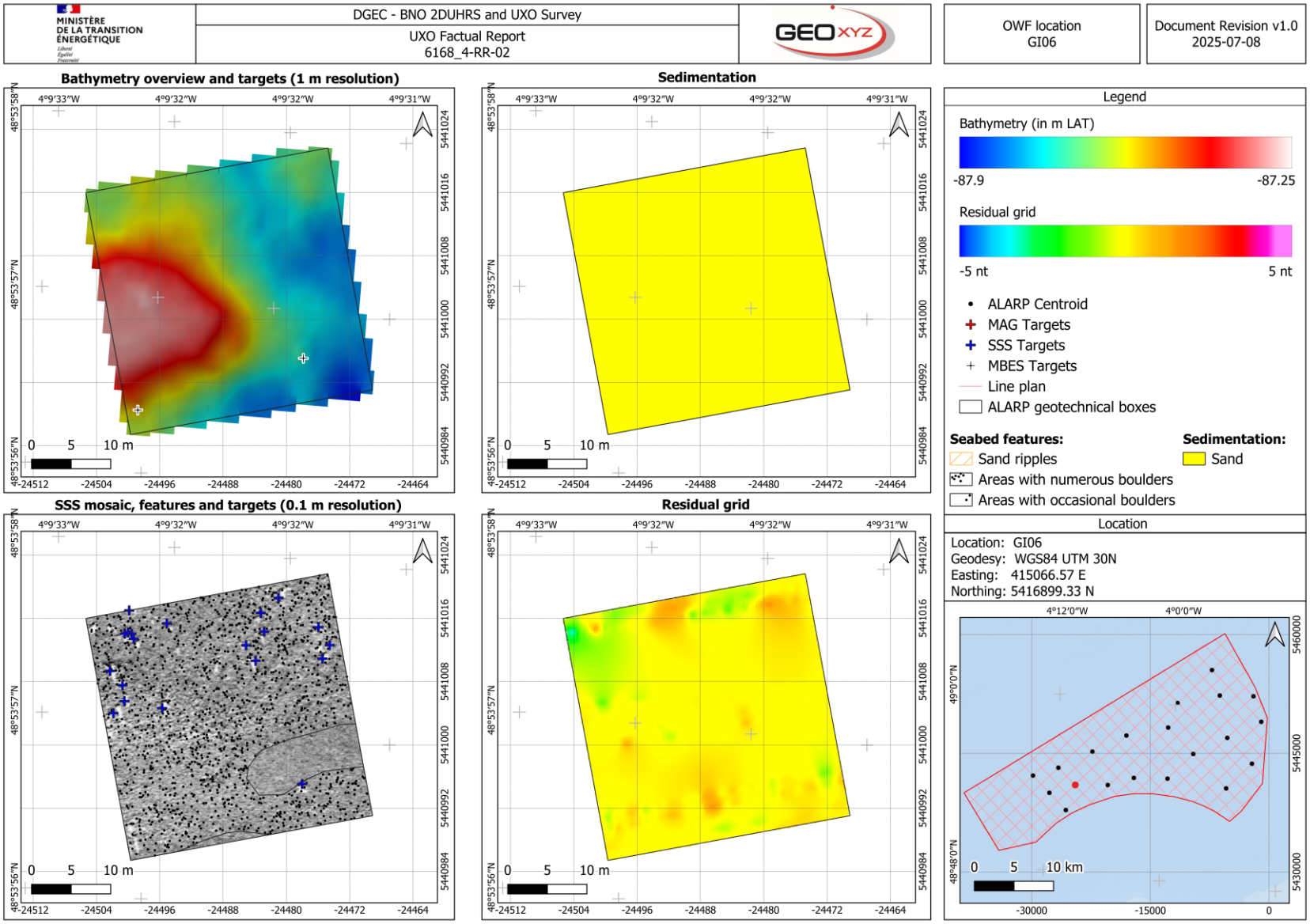
OWF location
GI04
Document Revision v1.0
2025-07-08
Bathymetry overview and targets (1 m resolution)
Sedimentation
SSS mosaic, features and targets (0.1 m resolution)
Residual grid
Legend
Bathymetry (in m LAT)
-83.25
-82.75
Residual grid
-5 nt
5 nt
ALARP Centroid
MAG Targets
SSS Targets
MBES Targets
Line plan
ALARP geotechnical boxes
Seabed features:
Sand ripples
Areas with numerous boulders
Areas with occasional boulders
Sedimentation:
Sand
Location
Location: GI04
Geodesy: WGS84 UTM 30N
Easting: 426593.1 E
Northing: 5418623.72 N
0 5 10 m
0 5 10 km


MINISTÈRE DE LA TRANSITION ÉNERGÉTIQUE
DGEC - BNO 2DUHRS and UXO Survey
UXO Factual Report
6168_4-RR-02
OWF location
GI05
Document Revision v1.0
2025-07-08
Bathymetry overview and targets (1 m resolution)
Sedimentation
SSS mosaic, features and targets (0.1 m resolution)
Residual grid
Legend
Bathymetry (in m LAT)
90.1
-89.5
Residual grid
-5 nt
5 nt
ALARP Centroid
MAG Targets
SSS Targets
MBES Targets
Line plan
ALARP geotechnical boxes
Seabed features:
Sand ripples
Areas with numerous boulders
Areas with occasional boulders
Sedimentation:
Sand
Location
Location: GI05
Geodesy: WGS84 UTM 30N
Easting: 412760 E
Northing: 5418881.03 N
4°11'28"W
4°11'27"W
4°11'26"W
48°55'0"N
5443184
5443176
5443168
5443160
5443152
-26656
-26648
-26640
-26632
-26624
-26616
0 5 10 m
4°12'0"W
4°0'0"W
49°0'0"N
48°48'0"N
5460000
5445000
5430000
0 5 10 km
-30000
-15000
0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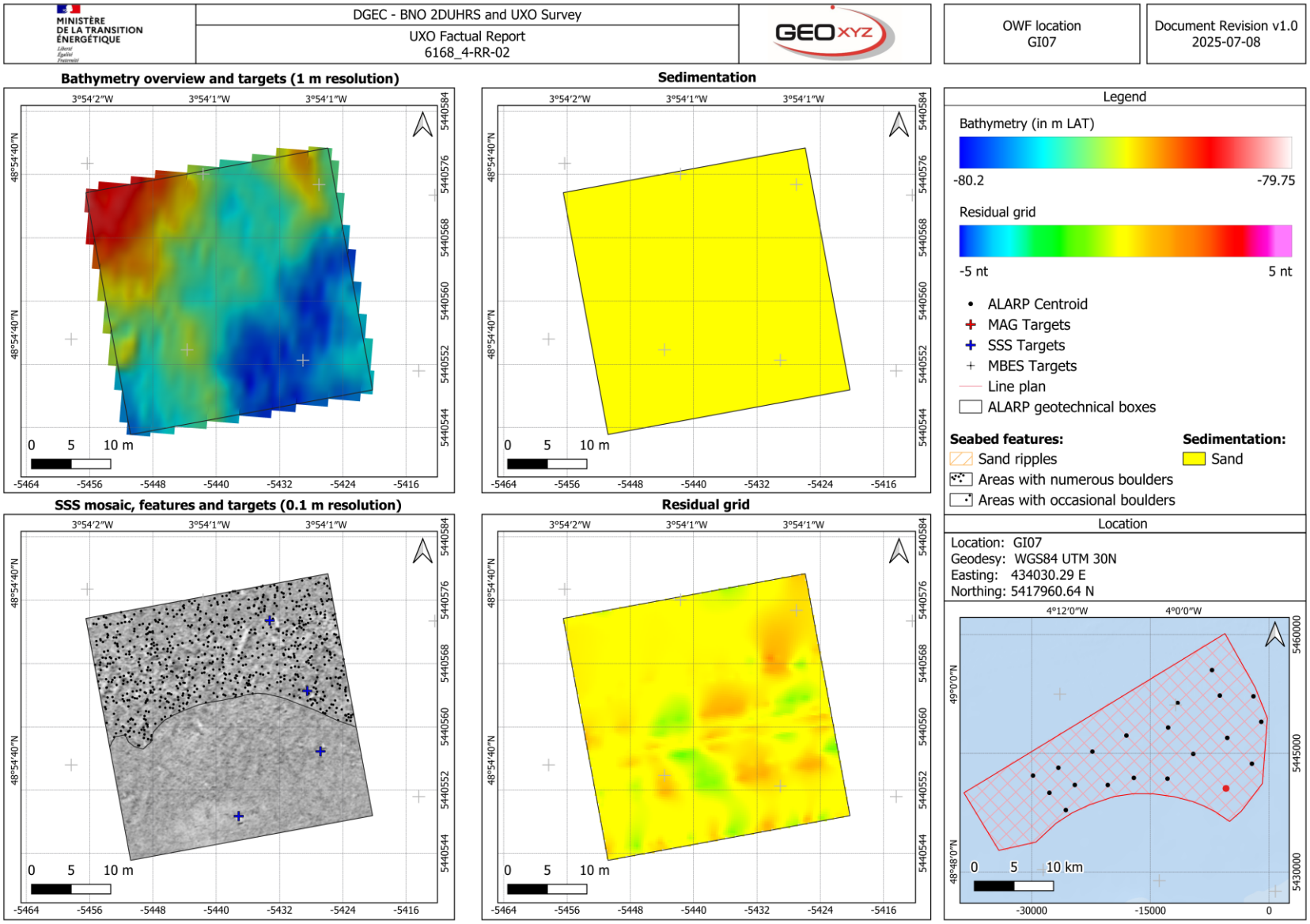
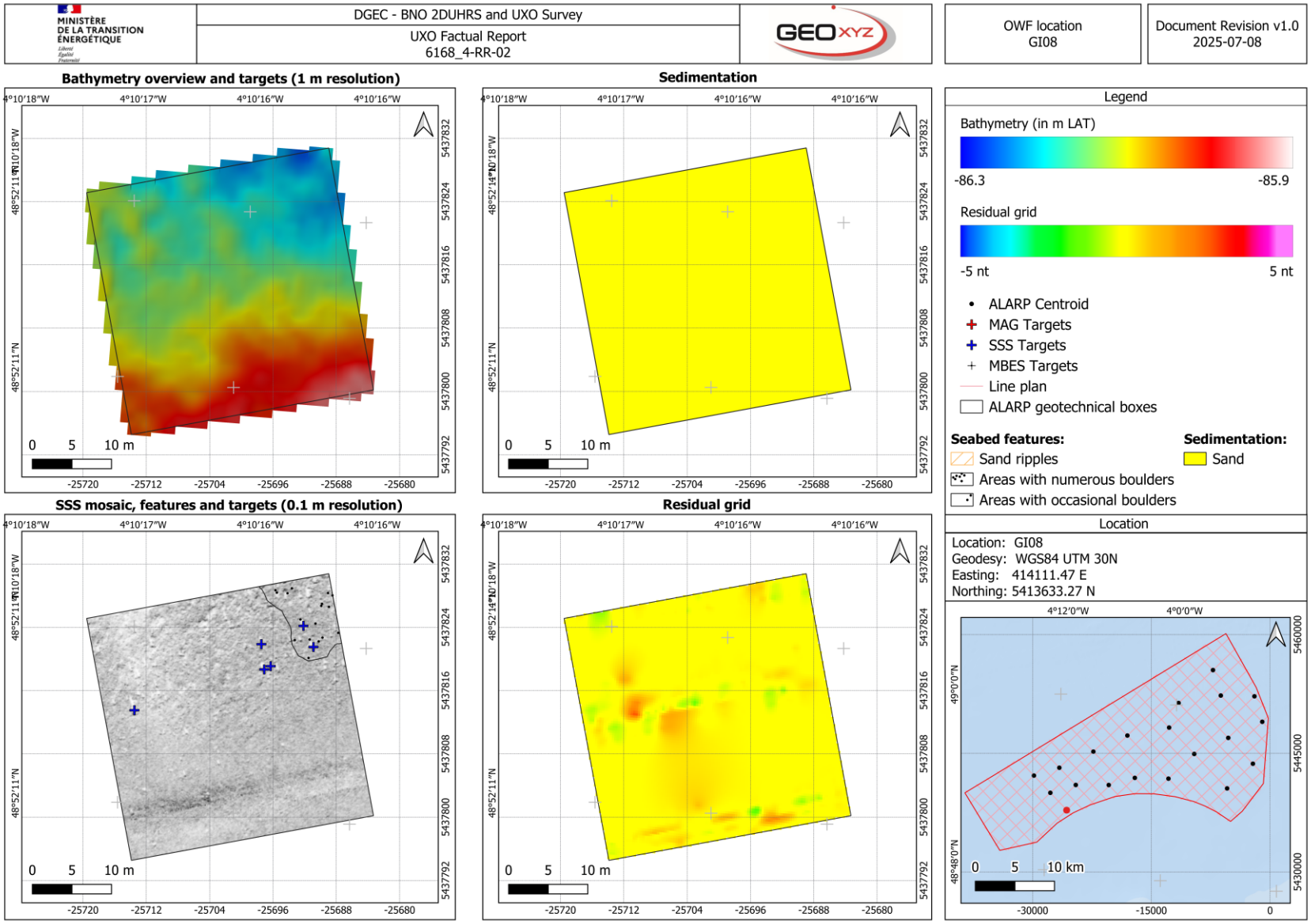
DGEC - BNO 2DUHRS and UXO Survey
UXO Factual Report
6168_4-RR-02
OWF location
GI06
Document Revision v1.0
2025-07-08
Bathymetry overview and targets (1 m resolution)
Sedimentation
SSS mosaic, features and targets (0.1 m resolution)
Residual grid
Legend
Bathymetry (in m LAT)
-87.9
-87.25
Residual grid
-5 nt
5 nt
ALARP Centroid
MAG Targets
SSS Targets
MBES Targets
Line plan
ALARP geotechnical boxes
Seabed features:
Sand ripples
Areas with numerous boulders
Areas with occasional boulders
Sedimentation:
Sand
Location
Location: GI06
Geodesy: WGS84 UTM 30N
Easting: 415066.57 E
Northing: 5416899.33 N
0 5 10 m
0 5 10 km


MINISTÈRE DE LA TRANSITION ÉNERGÉTIQUE
DGEC - BNO 2DUHRS and UXO Survey
UXO Factual Report
6168_4-RR-02
OWF location
GI07
Document Revision v1.0
2025-07-08
Bathymetry overview and targets (1 m resolution)
Sedimentation
SSS mosaic, features and targets (0.1 m resolution)
Residual grid
Legend
Bathymetry (in m LAT)
-80.2
-79.75
Residual grid
-5 nt
5 nt
ALARP Centroid
MAG Targets
SSS Targets
MBES Targets
Line plan
ALARP geotechnical boxes
Seabed features:
Sand ripples
Areas with numerous boulders
Areas with occasional boulders
Sedimentation:
Sand
Location
Location: GI07
Geodesy: WGS84 UTM 30N
Easting: 434030.29 E
Northing: 5417960.64 N
3°54'2"W
3°54'1"W
48°54'40"N
0 5 10 m
0 5 10 km
4°12'0"W
4°0'0"W
49°0'0"N
48°48'0"N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DGEC - BNO 2DUHRS and UXO Survey
UXO Factual Report
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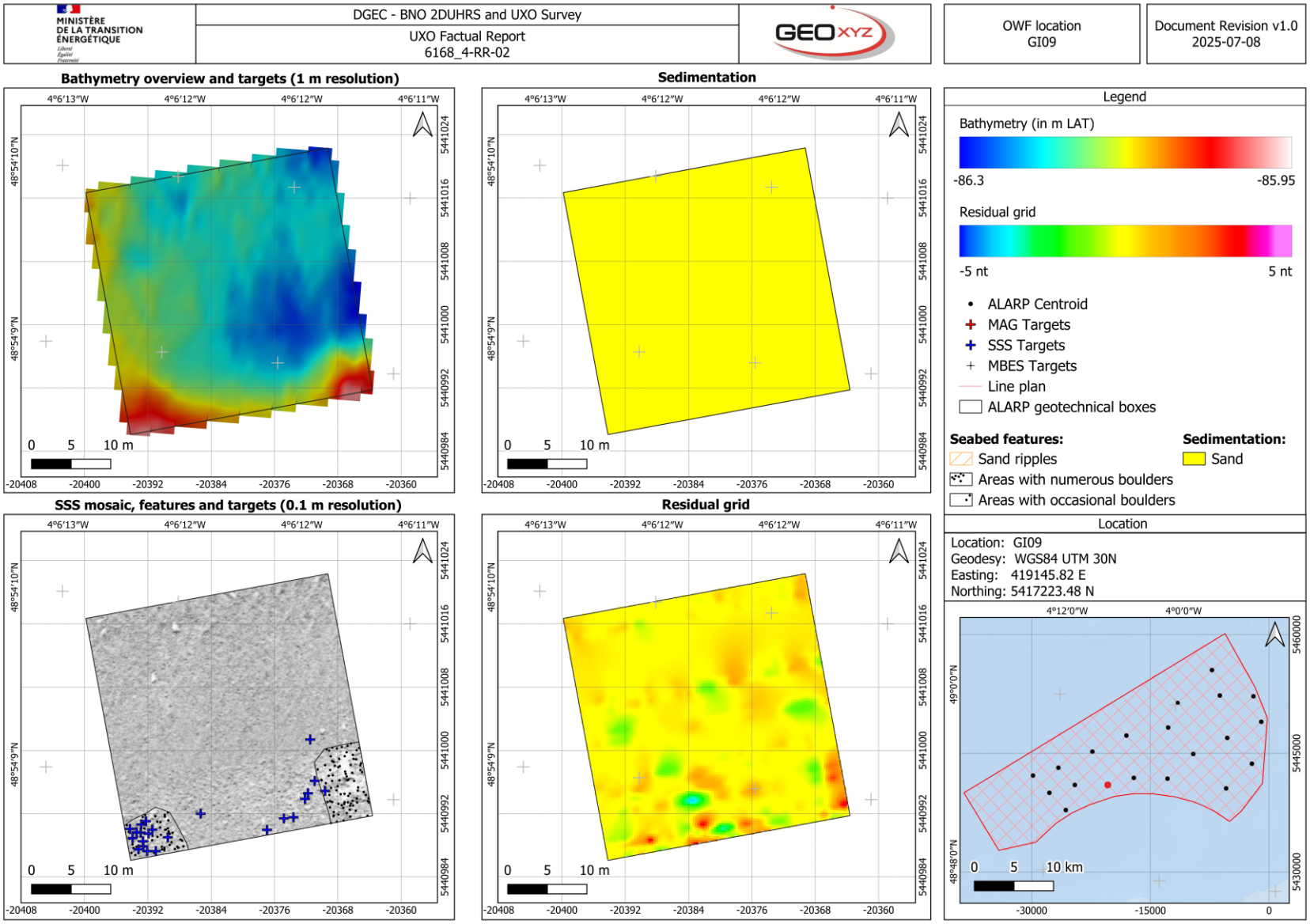
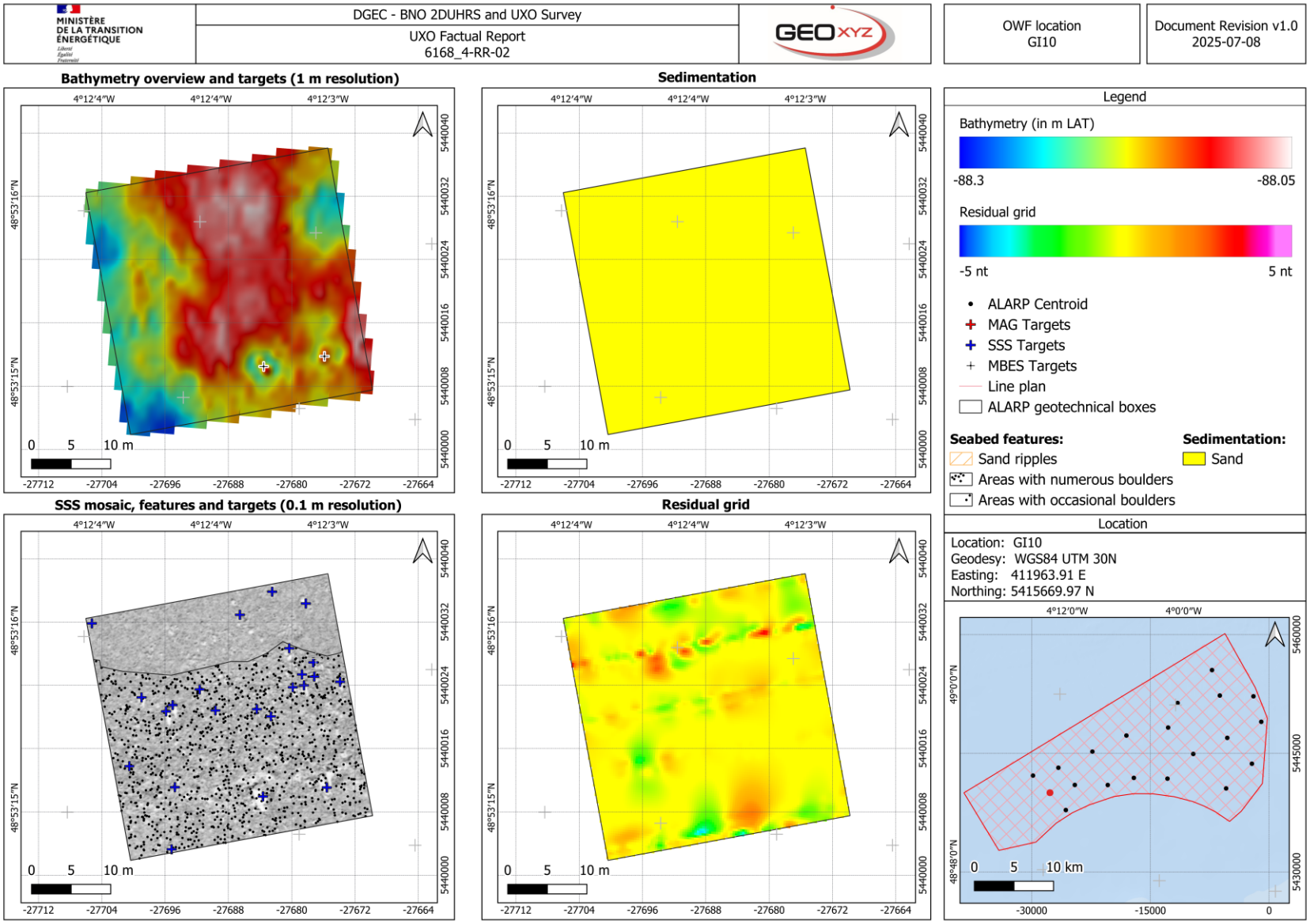
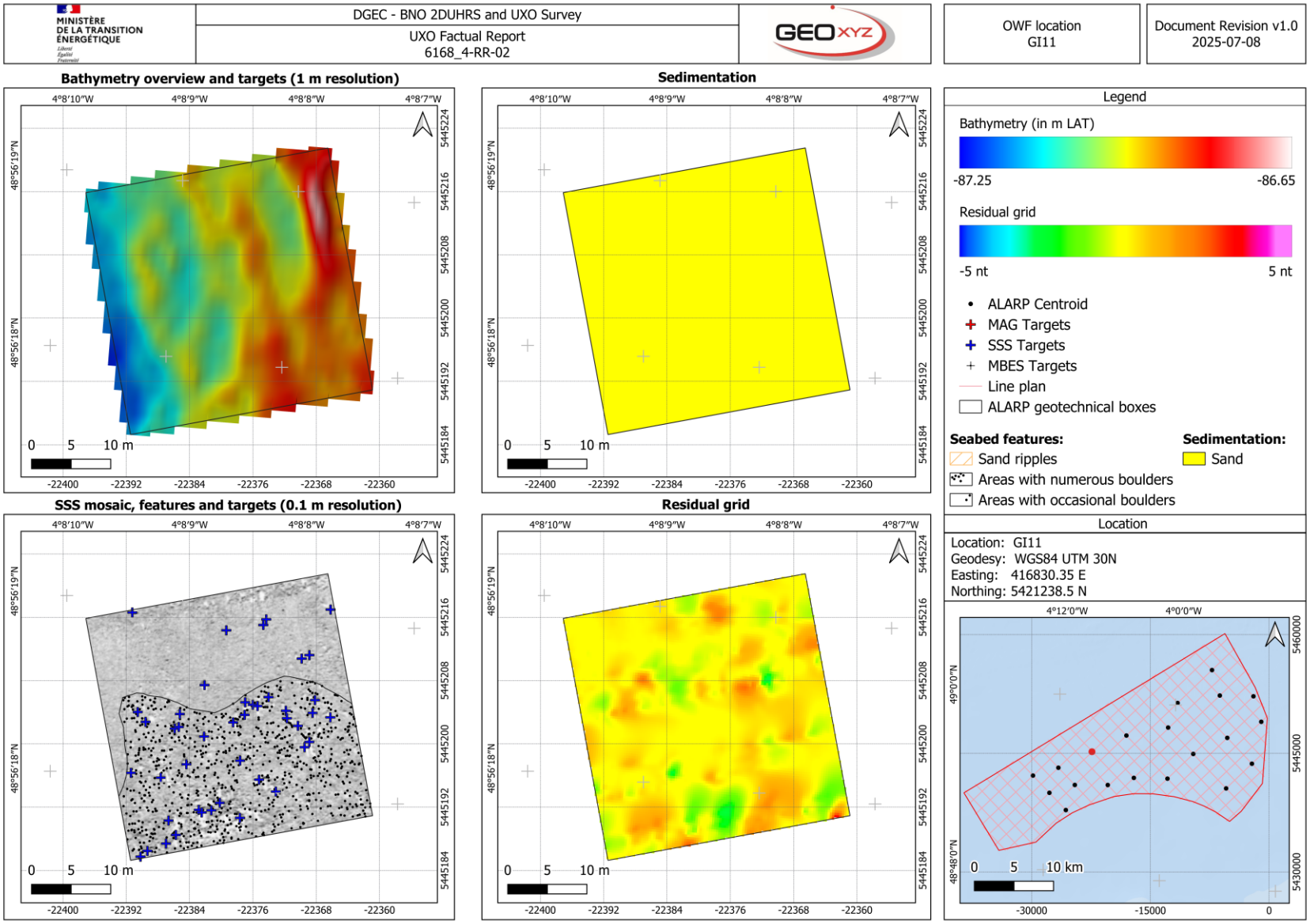
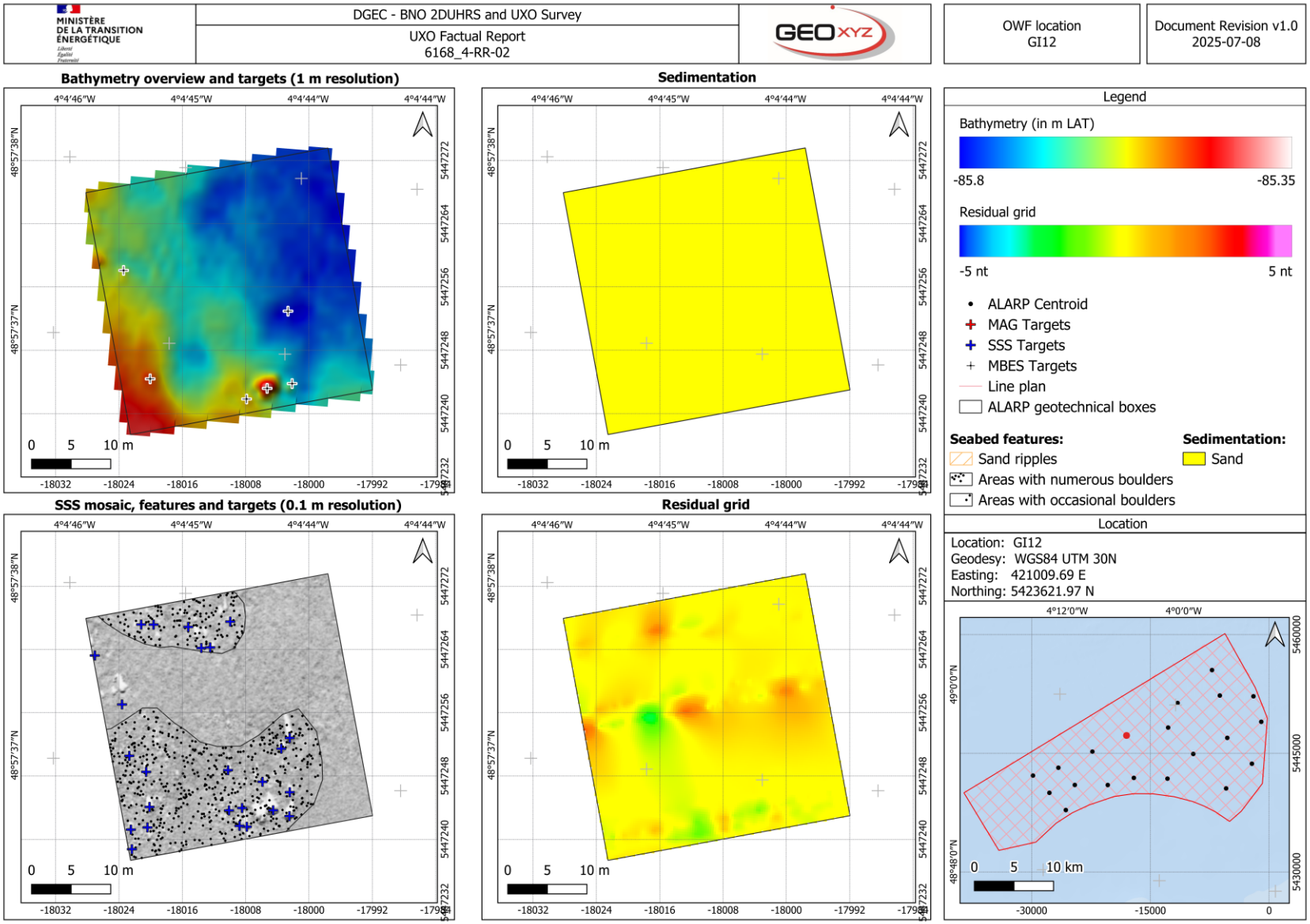
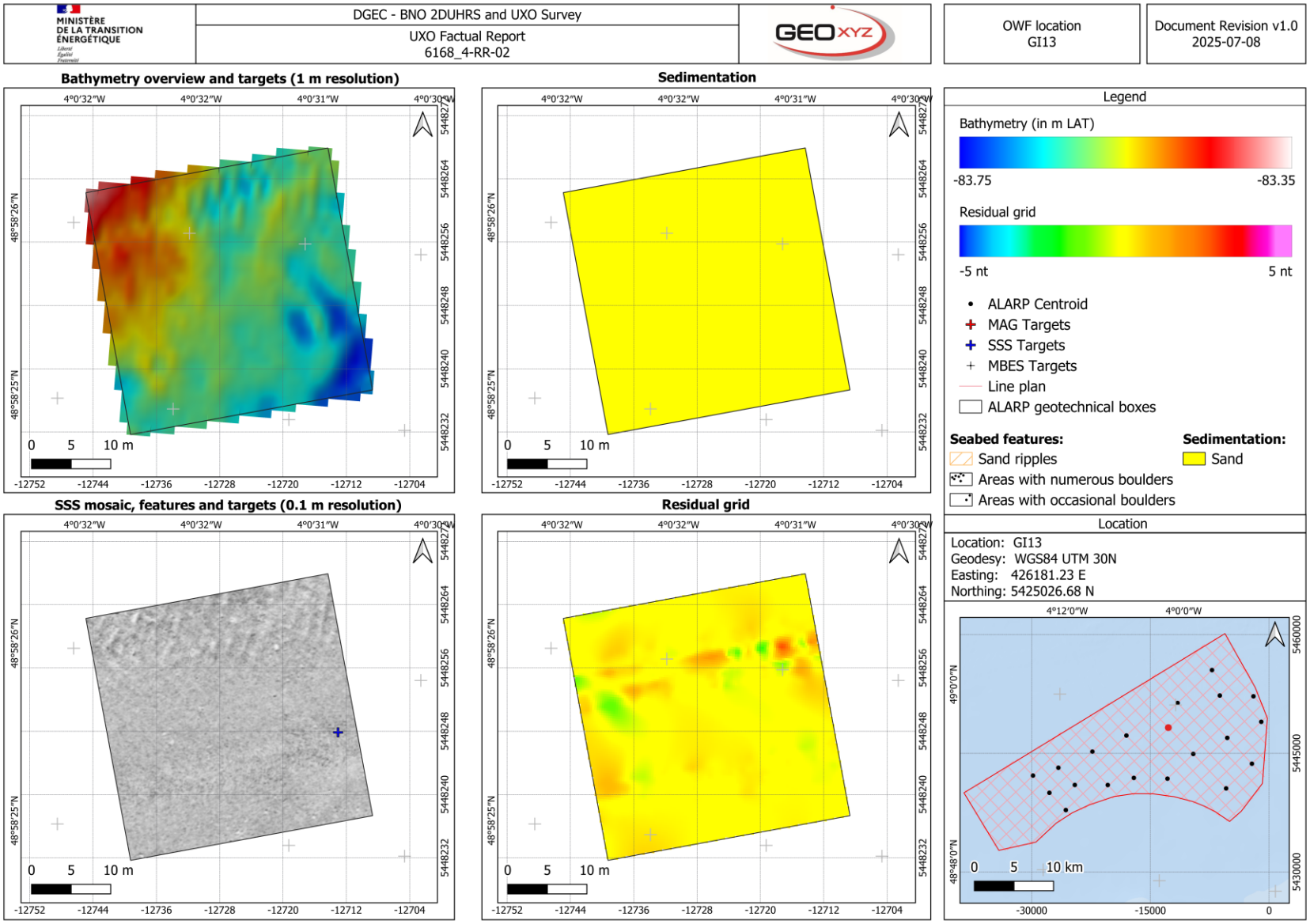
OWF location
GI08
Document Revision v1.0
2025-07-08
Bathymetry overview and targets (1 m resolution)
Sedimentation
SSS mosaic, features and targets (0.1 m resolution)
Residual grid
Legend
Bathymetry (in m LAT)
-86.3
-85.9
Residual grid
-5 nt
5 nt
ALARP Centroid
MAG Targets
SSS Targets
MBES Targets
Line plan
ALARP geotechnical boxes
Seabed features:
Sand ripples
Areas with numerous boulders
Areas with occasional boulders
Sedimentation:
Sand
Location
Location: GI08
Geodesy: WGS84 UTM 30N
Easting: 414111.47 E
Northing: 5413633.27 N
0 5 10 m
0 5 10 km

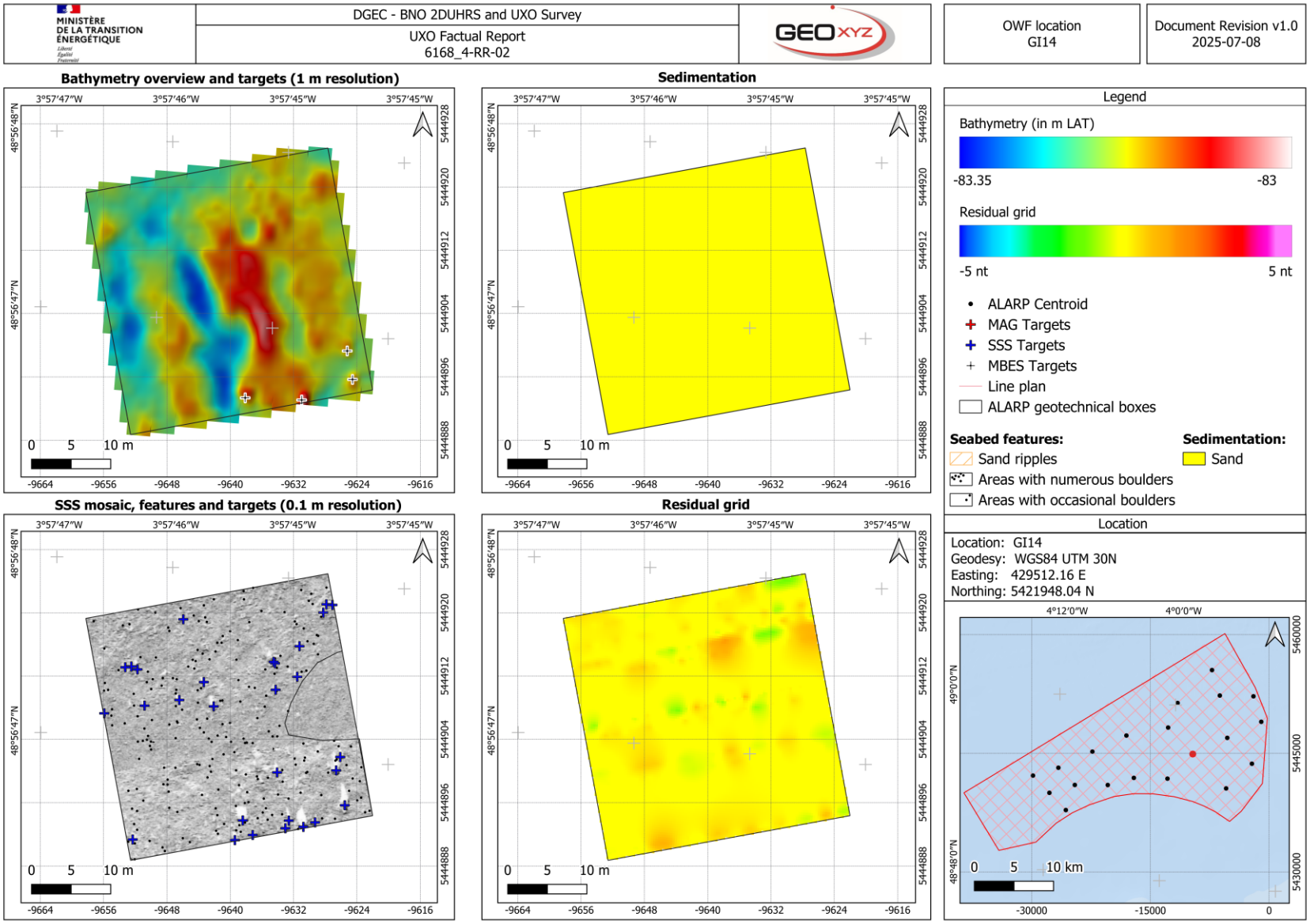

MINISTÈRE DE LA TRANSITION ÉNERGÉTIQUE
DGEC - BNO 2DUHRS and UXO Survey
UXO Factual Report
6168_4-RR-02
OWF location
GI09
Document Revision v1.0
2025-07-08
Bathymetry overview and targets (1 m resolution)
Sedimentation
SSS mosaic, features and targets (0.1 m resolution)
Residual grid
Legend
Bathymetry (in m LAT)
-86.3
-85.95
Residual grid
-5 nt
5 nt
ALARP Centroid
MAG Targets
SSS Targets
MBES Targets
Line plan
ALARP geotechnical boxes
Seabed features:
Sand ripples
Areas with numerous boulders
Areas with occasional boulders
Sedimentation:
Sand
Location
Location: GI09
Geodesy: WGS84 UTM 30N
Easting: 419145.82 E
Northing: 5417223.48 N
0 5 10 m
0 5 10 km

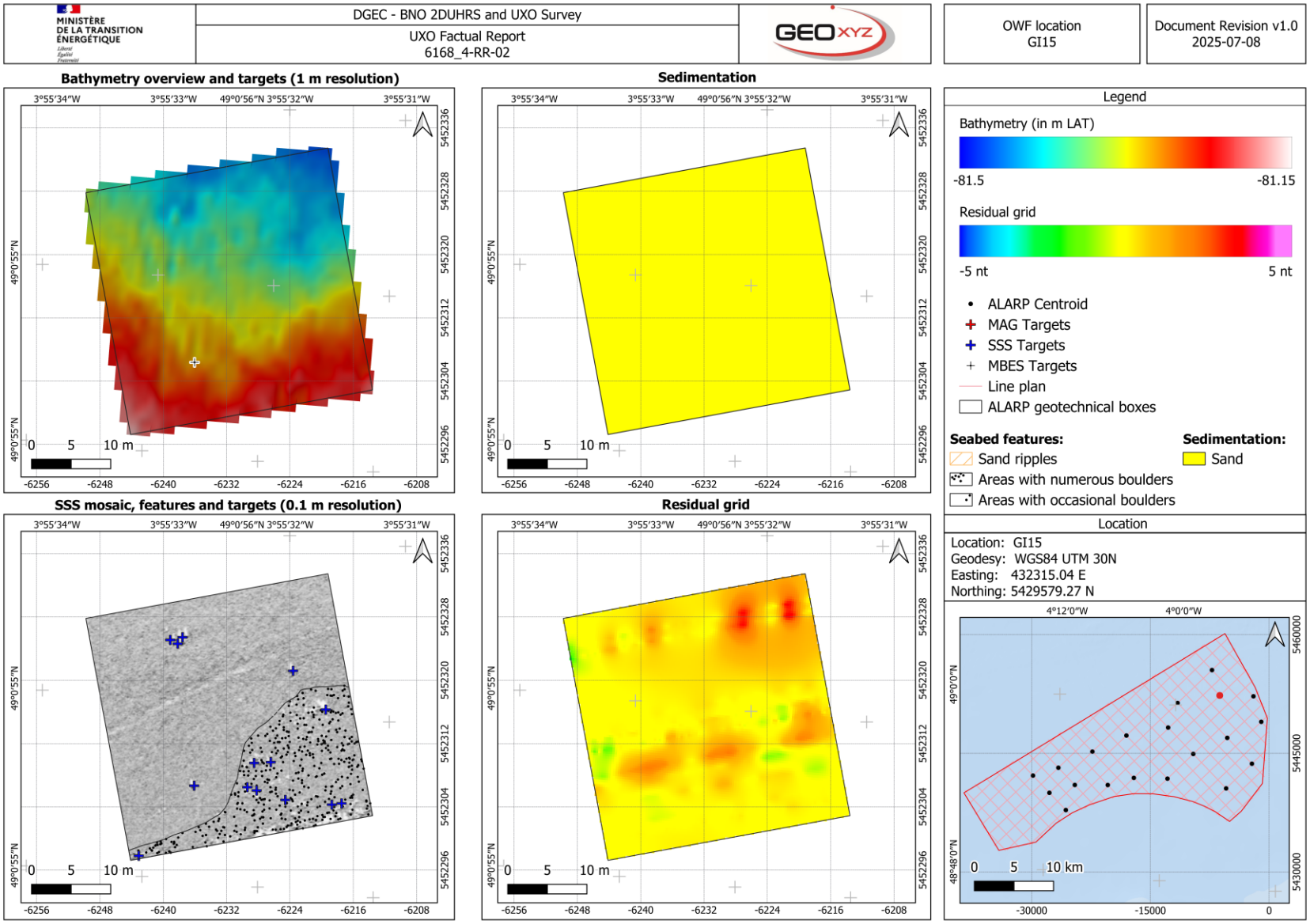

MINISTÈRE DE LA TRANSITION ÉNERGÉTIQUE
DGEC - BNO 2DUHRS and UXO Survey
UXO Factual Report
6168_4-RR-02
OWF location
GI10
Document Revision v1.0
2025-07-08
Bathymetry overview and targets (1 m resolution)
Sedimentation
SSS mosaic, features and targets (0.1 m resolution)
Residual grid
Legend
Bathymetry (in m LAT)
-88.3
-88.05
Residual grid
-5 nt
5 nt
ALARP Centroid
MAG Targets
SSS Targets
MBES Targets
Line plan
ALARP geotechnical boxes
Seabed features:
Sand ripples
Areas with numerous boulders
Areas with occasional boulders
Sedimentation:
Sand
Location
Location: GI10
Geodesy: WGS84 UTM 30N
Easting: 411963.91 E
Northing: 5415669.97 N
0 5 10 m
0 5 10 km

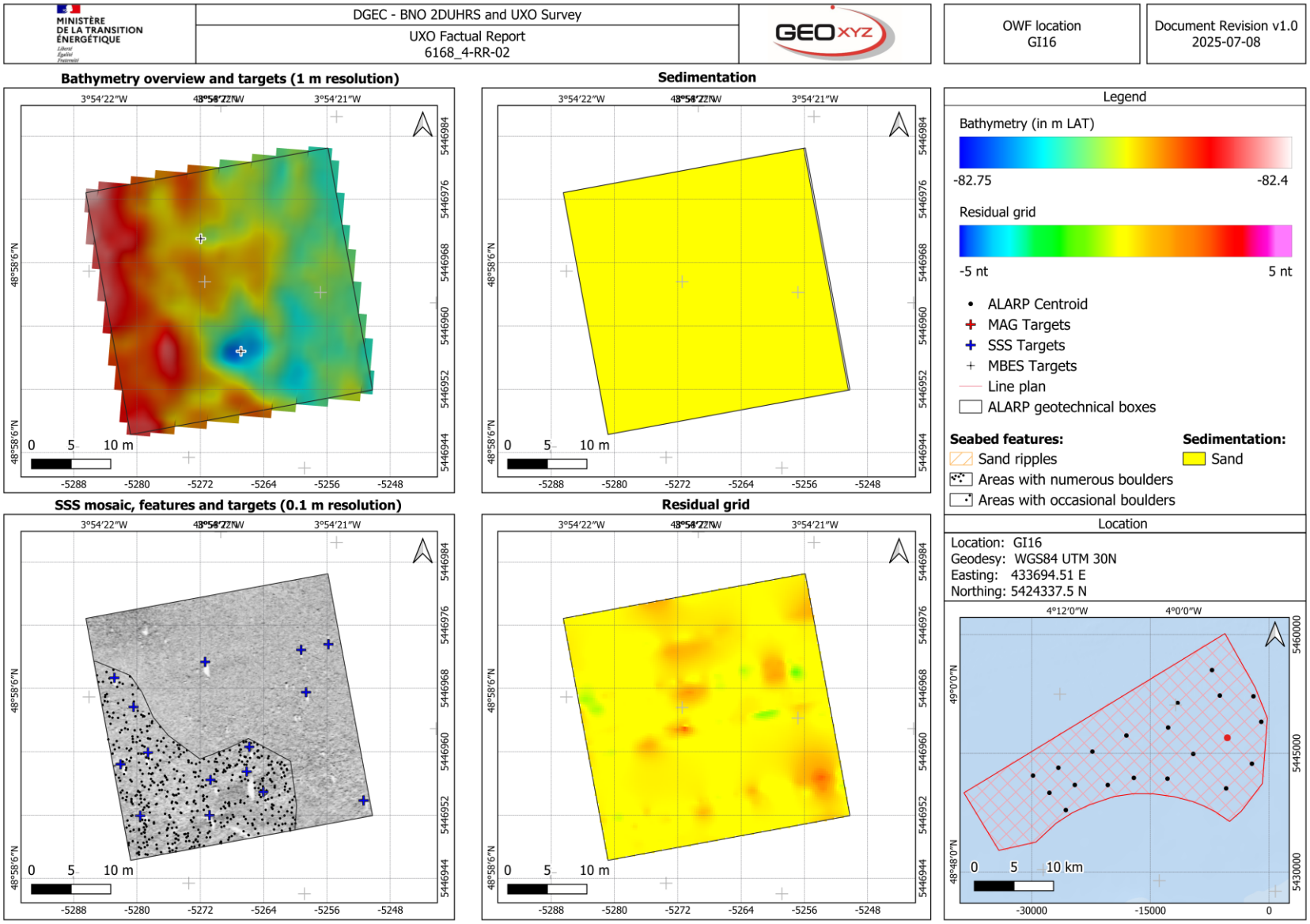

MINISTÈRE DE LA TRANSITION ÉNERGÉTIQUE
DGEC - BNO 2DUHRS and UXO Survey
UXO Factual Report
6168_4-RR-02
OWF location
GI11
Document Revision v1.0
2025-07-08
Bathymetry overview and targets (1 m resolution)
Sedimentation
SSS mosaic, features and targets (0.1 m resolution)
Residual grid
Legend
Bathymetry (in m LAT)
-87.25
-86.65
Residual grid
-5 nt
5 nt
ALARP Centroid
MAG Targets
SSS Targets
MBES Targets
Line plan
ALARP geotechnical boxes
Seabed features:
Sand ripples
Areas with numerous boulders
Areas with occasional boulders
Sedimentation:
Sand
Location
Location: GI11
Geodesy: WGS84 UTM 30N
Easting: 416830.35 E
Northing: 5421238.5 N
0 5 10 m
0 5 10 km

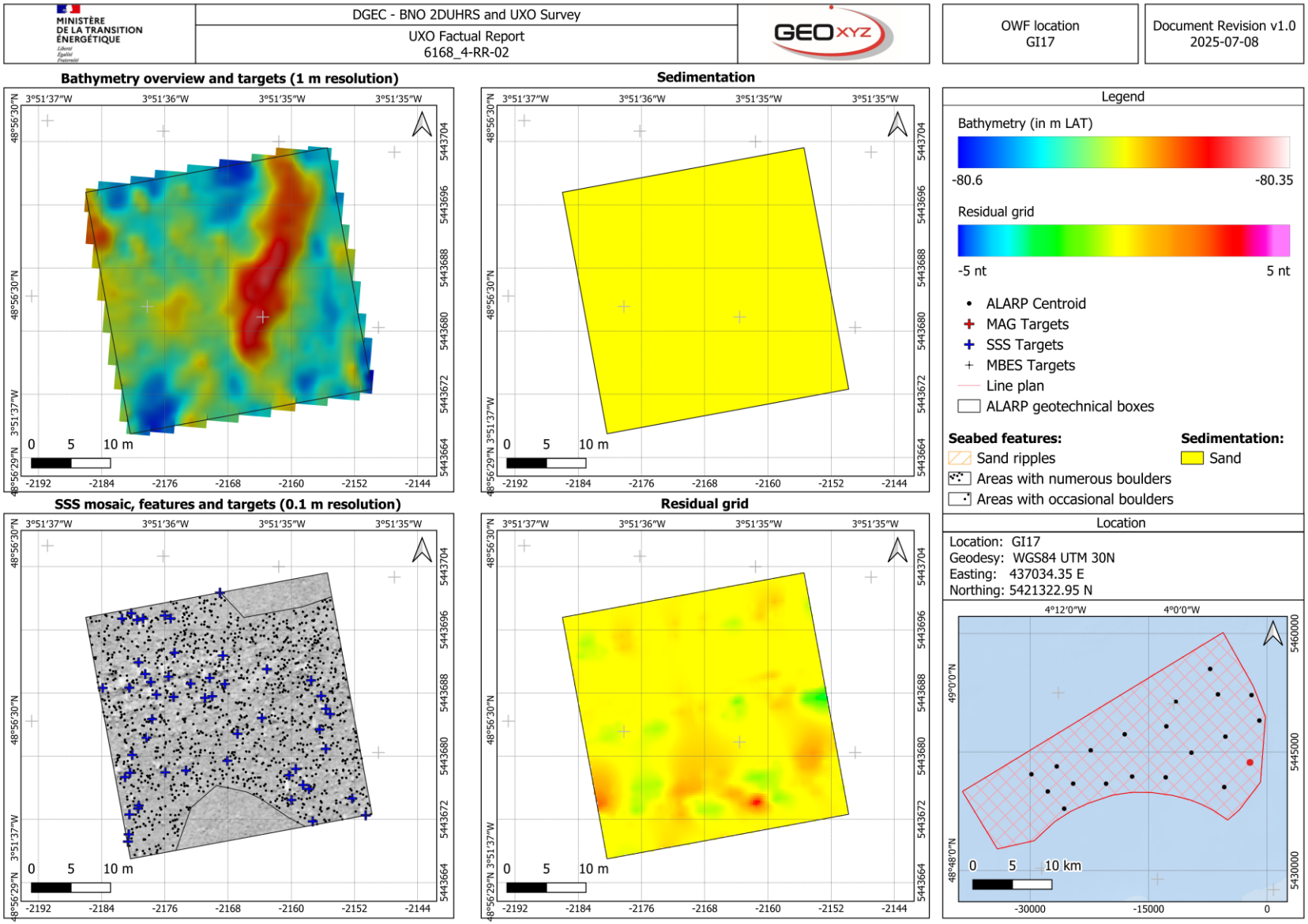

MINISTÈRE DE LA TRANSITION ÉNERGÉTIQUE
DGEC - BNO 2DUHRS and UXO Survey
UXO Factual Report
6168_4-RR-02
OWF location
GI12
Document Revision v1.0
2025-07-08
Bathymetry overview and targets (1 m resolution)
Sedimentation
SSS mosaic, features and targets (0.1 m resolution)
Residual grid
Legend
Bathymetry (in m LAT)
-85.8
-85.35
Residual grid
-5 nt
5 nt
ALARP Centroid
MAG Targets
SSS Targets
MBES Targets
Line plan
ALARP geotechnical boxes
Seabed features:
Sand ripples
Areas with numerous boulders
Areas with occasional boulders
Sedimentation:
Sand
Location
Location: GI12
Geodesy: WGS84 UTM 30N
Easting: 421009.69 E
Northing: 5423621.97 N
4°4'46"W
4°4'45"W
4°4'44"W
48°57'38"N
48°57'37"N
0 5 10 m
0 5 10 km

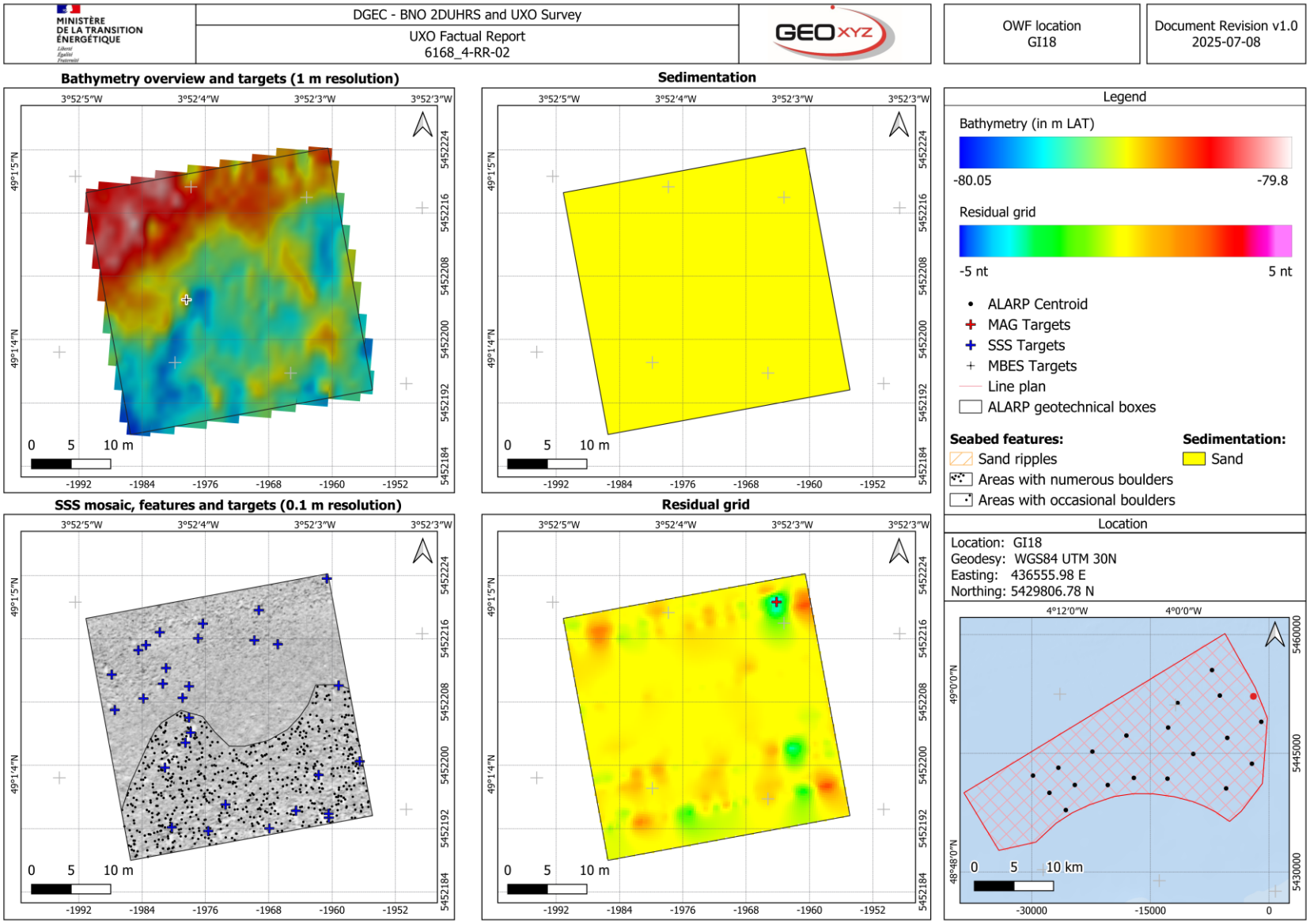

MINISTÈRE DE LA TRANSITION ÉNERGÉTIQUE
DGEC - BNO 2DUHRS and UXO Survey
UXO Factual Report
6168_4-RR-02
OWF location
GI13
Document Revision v1.0
2025-07-08
Bathymetry overview and targets (1 m resolution)
Sedimentation
SSS mosaic, features and targets (0.1 m resolution)
Residual grid
Legend
Bathymetry (in m LAT)
-83.75
-83.35
Residual grid
-5 nt
5 nt
ALARP Centroid
MAG Targets
SSS Targets
MBES Targets
Line plan
ALARP geotechnical boxes
Seabed features:
Sand ripples
Areas with numerous boulders
Areas with occasional boulders
Sedimentation:
Sand
Location
Location: GI13
Geodesy: WGS84 UTM 30N
Easting: 426181.23 E
Northing: 5425026.68 N
0 5 10 m
0 5 10 km

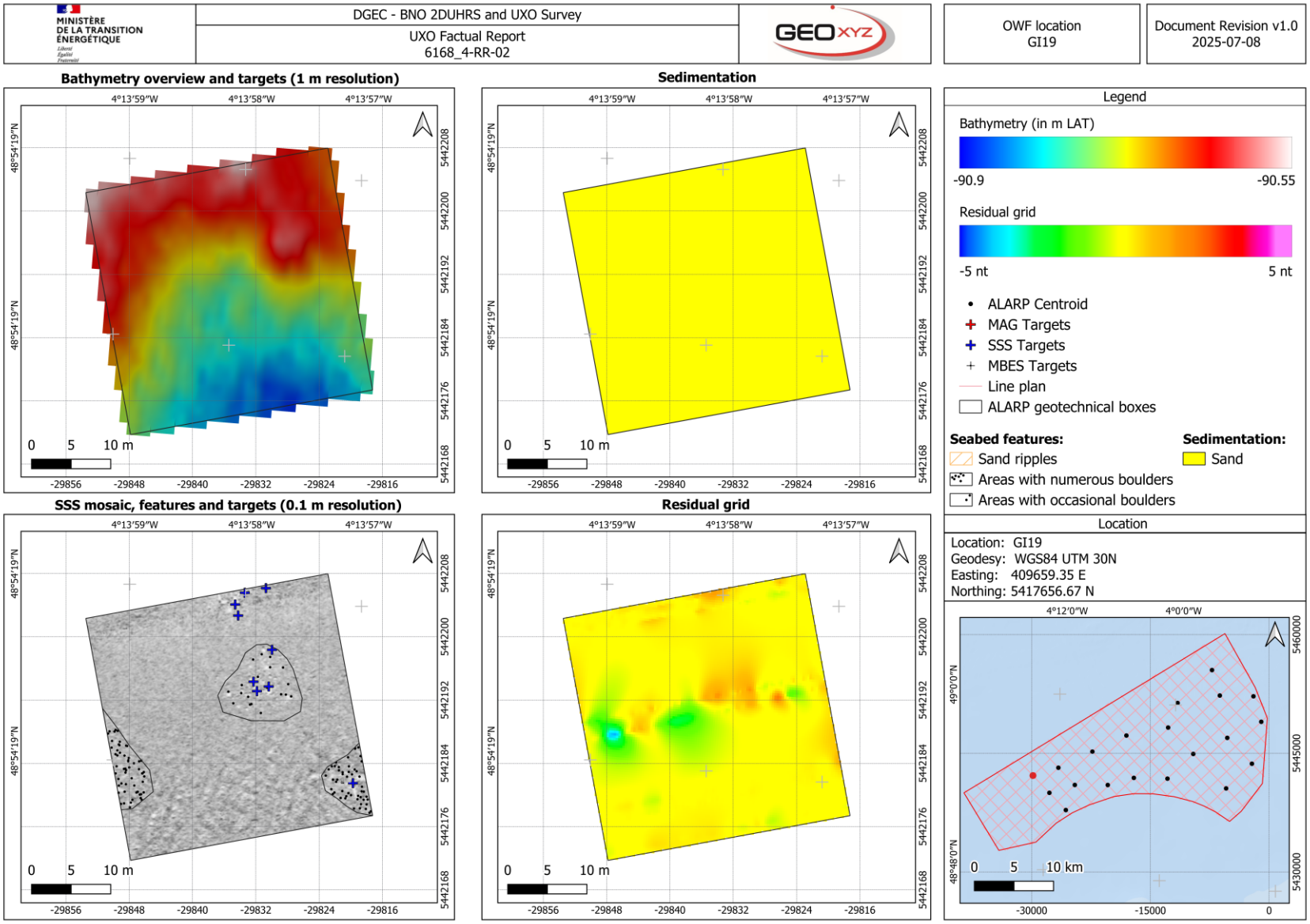

MINISTÈRE DE LA TRANSITION ÉNERGÉTIQUE
DGEC - BNO 2DUHRS and UXO Survey
UXO Factual Report
6168_4-RR-02
OWF location
GI14
Document Revision v1.0
2025-07-08
Bathymetry overview and targets (1 m resolution)
Sedimentation
SSS mosaic, features and targets (0.1 m resolution)
Residual grid
Legend
Bathymetry (in m LAT)
-83.35
-83
Residual grid
-5 nt
5 nt
ALARP Centroid
MAG Targets
SSS Targets
MBES Targets
Line plan
ALARP geotechnical boxes
Seabed features:
Sand ripples
Areas with numerous boulders
Areas with occasional boulders
Sedimentation:
Sand
Location
Location: GI14
Geodesy: WGS84 UTM 30N
Easting: 429512.16 E
Northing: 5421948.04 N
0 5 10 m
0 5 10 km

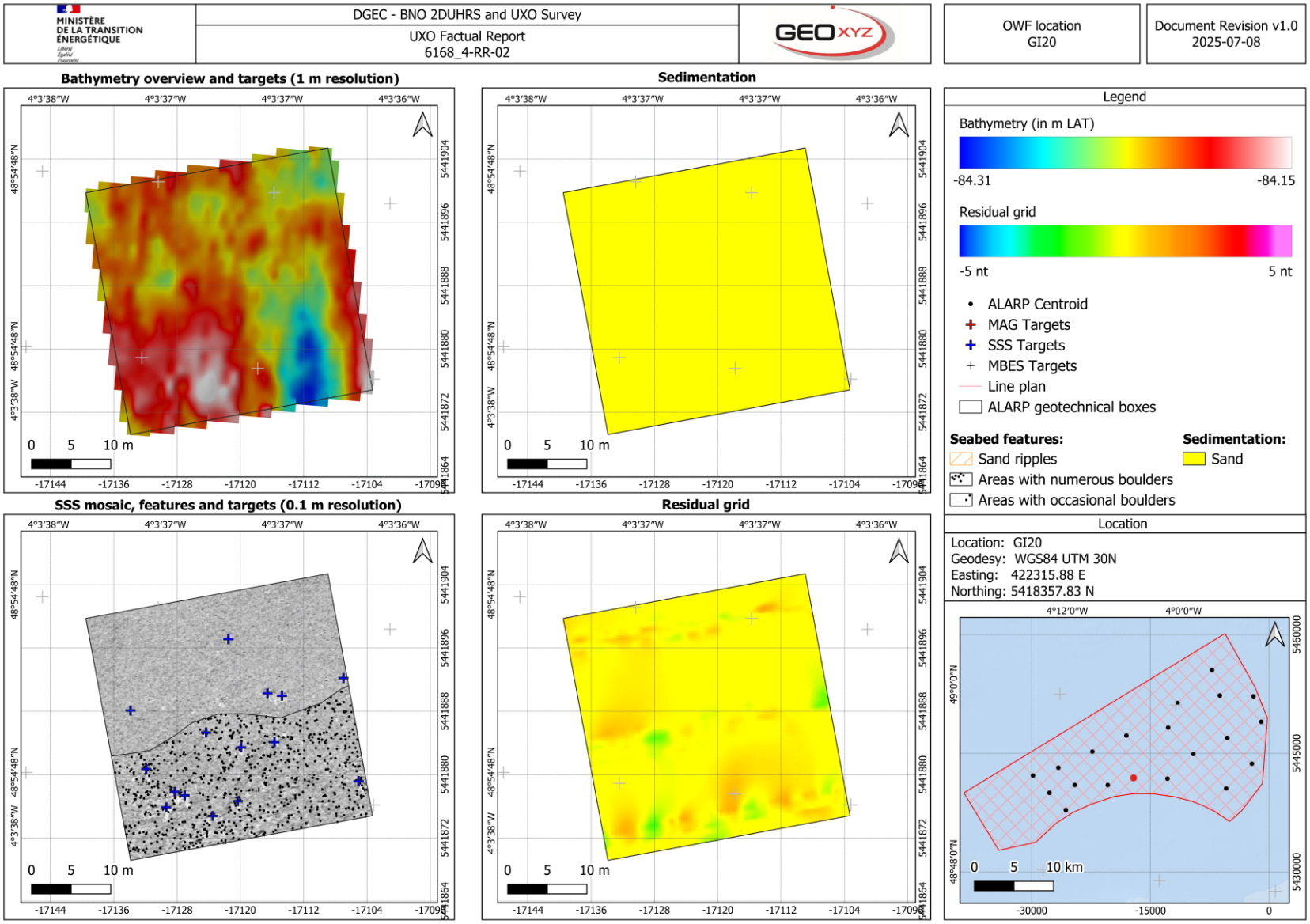

MINISTÈRE DE LA TRANSITION ÉNERGÉTIQUE
DGEC - BNO 2DUHRS and UXO Survey
UXO Factual Report
6168_4-RR-02
OWF location
GI15
Document Revision v1.0
2025-07-08
Bathymetry overview and targets (1 m resolution)
Sedimentation
SSS mosaic, features and targets (0.1 m resolution)
Residual grid
Legend
Bathymetry (in m LAT)
-81.5
-81.15
Residual grid
-5 nt
5 nt
ALARP Centroid
MAG Targets
SSS Targets
MBES Targets
Line plan
ALARP geotechnical boxes
Seabed features:
Sand ripples
Areas with numerous boulders
Areas with occasional boulders
Sedimentation:
Sand
Location
Location: GI15
Geodesy: WGS84 UTM 30N
Easting: 432315.04 E
Northing: 5429579.27 N
0 5 10 m
0 5 10 km


MINISTÈRE DE LA TRANSITION ÉNERGÉTIQUE
DGEC - BNO 2DUHRS and UXO Survey
UXO Factual Report
6168_4-RR-02
OWF location
GI16
Document Revision v1.0
2025-07-08
Bathymetry overview and targets (1 m resolution)
Sedimentation
SSS mosaic, features and targets (0.1 m resolution)
Residual grid
Legend
Bathymetry (in m LAT)
-82.75
-82.4
Residual grid
-5 nt
5 nt
ALARP Centroid
MAG Targets
SSS Targets
MBES Targets
Line plan
ALARP geotechnical boxes
Seabed features:
Sand ripples
Areas with numerous boulders
Areas with occasional boulders
Sedimentation:
Sand
Location
Location: GI16
Geodesy: WGS84 UTM 30N
Easting: 433694.51 E
Northing: 5424337.5 N
3°54'22"W
3°54'21"W
48°58'6"N
0 5 10 m
0 5 10 km
-5288 -5280 -5272 -5264 -5256 -5248
4°12'0"W
4°0'0"W
49°0'0"N
48°48'0"N
-30000 -15000 0


MINISTÈRE DE LA TRANSITION ÉNERGÉTIQUE
DGEC - BNO 2DUHRS and UXO Survey
UXO Factual Report
6168_4-RR-02
OWF location
GI17
Document Revision v1.0
2025-07-08
Bathymetry overview and targets (1 m resolution)
Sedimentation
SSS mosaic, features and targets (0.1 m resolution)
Residual grid
Legend
Bathymetry (in m LAT)
-80.6
-80.35
Residual grid
-5 nt
5 nt
ALARP Centroid
MAG Targets
SSS Targets
MBES Targets
Line plan
ALARP geotechnical boxes
Seabed features:
Sand ripples
Areas with numerous boulders
Areas with occasional boulders
Sedimentation:
Sand
Location
Location: GI17
Geodesy: WGS84 UTM 30N
Easting: 437034.35 E
Northing: 5421322.95 N
0 5 10 m
0 5 10 km


MINISTÈRE DE LA TRANSITION ÉNERGÉTIQUE
DGEC - BNO 2DUHRS and UXO Survey
UXO Factual Report
6168_4-RR-02
OWF location
GI18
Document Revision v1.0
2025-07-08
Bathymetry overview and targets (1 m resolution)
Sedimentation
SSS mosaic, features and targets (0.1 m resolution)
Residual grid
Legend
Bathymetry (in m LAT)
-80.05
-79.8
Residual grid
-5 nt
5 nt
ALARP Centroid
MAG Targets
SSS Targets
MBES Targets
Line plan
ALARP geotechnical boxes
Seabed features:
Sand ripples
Areas with numerous boulders
Areas with occasional boulders
Sedimentation:
Sand
Location
Location: GI18
Geodesy: WGS84 UTM 30N
Easting: 436555.98 E
Northing: 5429806.78 N
3°52'5"W
3°52'4"W
3°52'3"W
49°1'5"N
49°1'4"N
0 5 10 m
0 5 10 km


MINISTÈRE DE LA TRANSITION ÉNERGÉTIQUE
DGEC - BNO 2DUHRS and UXO Survey
UXO Factual Report
6168_4-RR-02
OWF location
GI19
Document Revision v1.0
2025-07-08
Bathymetry overview and targets (1 m resolution)
Sedimentation
SSS mosaic, features and targets (0.1 m resolution)
Residual grid
Legend
Bathymetry (in m LAT)
-90.9
-90.55
Residual grid
-5 nt
5 nt
ALARP Centroid
MAG Targets
SSS Targets
MBES Targets
Line plan
ALARP geotechnical boxes
Seabed features:
Sand ripples
Areas with numerous boulders
Areas with occasional boulders
Sedimentation:
Sand
Location
Location: GI19
Geodesy: WGS84 UTM 30N
Easting: 409659.35 E
Northing: 5417656.67 N
4°13'59"W
4°13'58"W
4°13'57"W
48°54'19"N
0 5 10 m
0 5 10 km
4°12'0"W
4°0'0"W
49°0'0"N
48°48'0"N


MINISTÈRE DE LA TRANSITION ÉNERGÉTIQUE
DGEC - BNO 2DUHRS and UXO Survey
UXO Factual Report
6168_4-RR-02
OWF location
GI20
Document Revision v1.0
2025-07-08
Bathymetry overview and targets (1 m resolution)
Sedimentation
SSS mosaic, features and targets (0.1 m resolution)
Residual grid
Legend
Bathymetry (in m LAT)
-84.31
-84.15
Residual grid
-5 nt
5 nt
ALARP Centroid
MAG Targets
SSS Targets
MBES Targets
Line plan
ALARP geotechnical boxes
Seabed features:
Sand ripples
Areas with numerous boulders
Areas with occasional boulders
Sedimentation:
Sand
Location
Location: GI20
Geodesy: WGS84 UTM 30N
Easting: 422315.88 E
Northing: 5418357.83 N
0 5 10 m
0 5 10 km

APPENDIX B. ALARP CERTIFICATES