



GULF-WIDE WATER QUALITY SURVEY
MAPPING OF THE PLUME USING SONAR
SURVEY RESULTS

INTERIM REPORT 2

Prepared for
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1 INTRODUCTION

1.1 Project Description

On 20th April 2010 there was a blowout on drilling rig Deepwater Horizons at Mississippi Canyon 252 (MC252) off the Louisiana coast, 28° 44.3'N 88° 23.2'W. The surface plume has extended around the Mississippi delta, affecting the coast from Louisiana to Florida.

The surface position of the resulting plume is being tracked by satellite imagery and daily overflight observations. Initially, relatively little was known about the sub-surface plume. EGS Group was contracted by CSA International Inc (CSA) to supply sonar survey mapping services to map the sub-surface plume. This included mapping the location of the plume both within the water column and across the seabed.

1.2 Interim Reports of Survey Results

The sub-surface plume is dynamic: measurements provide a snapshot of conditions at that time, location and depth. To provide the measured data in a timely manner, the information is being presented in a sequence of interim reports, each covering a survey task. The survey task covered in this report is summarised in Table 1.

Sequential Survey Pass No.	Date		Geographical Location	Description
	Start	End		
2	27/6/2010	28/6/2010	Northwest and southwest quadrants established around the MC252 site, close to exclusion zone boundary.	This interim report covers the sonar files collected during survey operations.

Table 1: Summary Table of RV Ridley Thomas Survey Operations

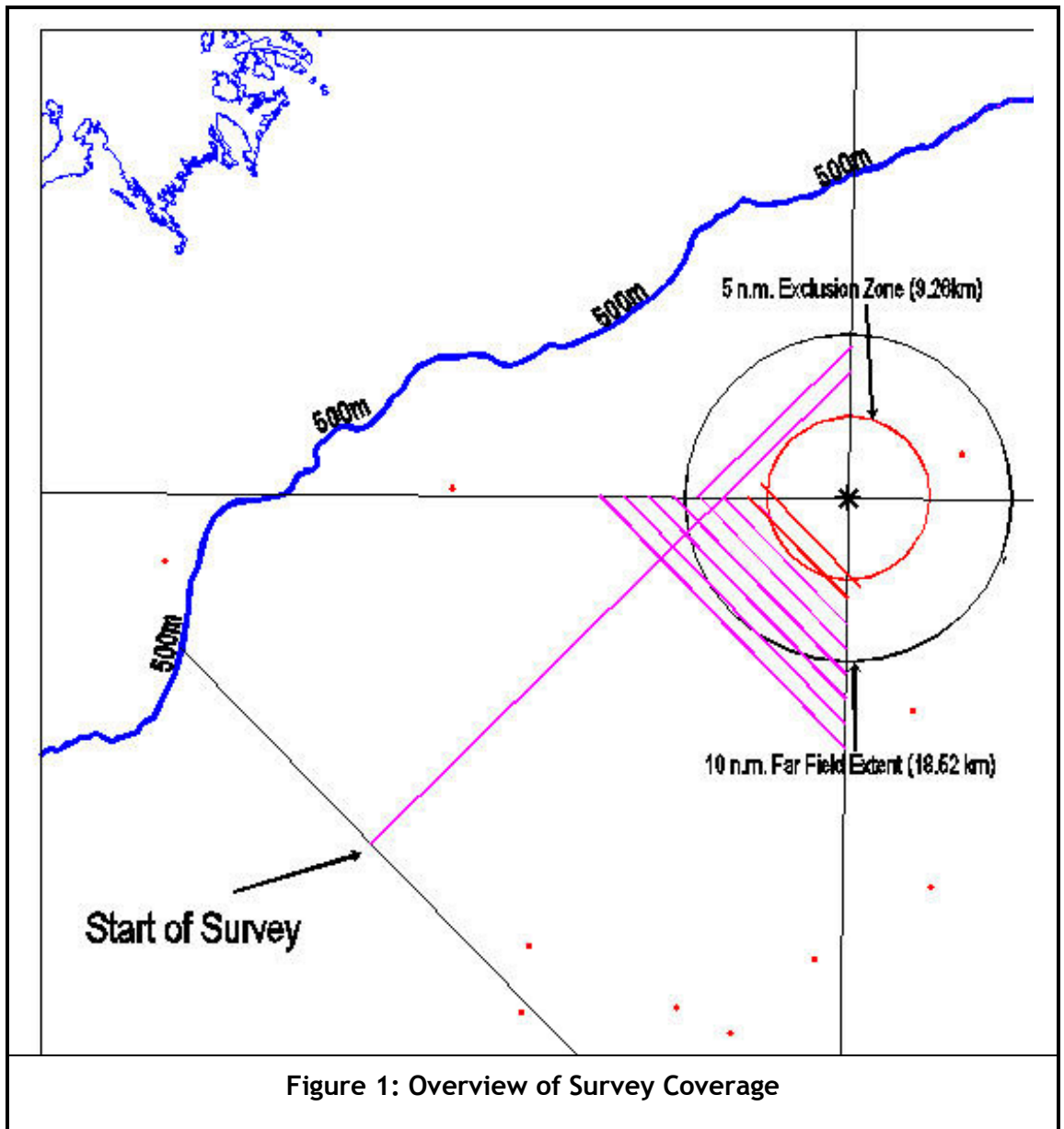
1.3 Survey Procedures

Survey procedures are documented in the Project Quality Manual (PQM), provided under separate cover. This includes health, safety and environmental considerations. It also defines measurement units and descriptive terms.

1.4 Survey Coverage

An overview of survey coverage is shown in Figure 1. For convenience in preparing the data for presentation, this phase of the survey has been divided into 2 blocks, based on the sequence in which the work was completed:

- Northwest quadrant lines, with offsets of 10km and 12km (part line)
- Southwest quadrant lines, with offsets of 6km through to 20km at 2km intervals (8 lines)



Details of the locations of individual data files are shown in Section 2 below.

2 SURVEY RESULTS

2.1 Appendix A, Log Sheets

The log sheets recording details of the survey operation are presented in Appendix A. There are separate log sheet files for the EA400 single beam echo sounder and for the EM12 swath bathymetry, operated together with the EA400 on southwest quadrant lines 18 and 20.

2.2 Appendix B, CTD Casts

Not used.

2.3 Appendix C, Sonar Mapping of the Water Column

2.3.1 Sonar Data Files

The location of the traverses of sonar profiling carried out during this survey phase are shown in the Data Drop 2 ShipsTrack.dwg included in Appendix C and detailed in the survey log sheets, Appendix A.

The file name structure for the EM400 (38khz sonar) raw data files is:

GWWQS_RT_xx_yy_001.raw

where:

- **xx** is the quadrant identifier (NW for Northwest and SW for Southwest).
- **yy** is the line offset in km from the MC252 location
- **raw** indicates that it is the raw data file.

The information in the files is the raw data from the manufacturer's acquisition software, taken directly from the logging computer. No processing or any other alteration.

The navigation data is embedded in these files. The data structure interleaves sonar records and navigation strings.

Also included in Appendix C are screen grabs of the data as displayed on the echosounder (H0000-D20100627-T114710.bmp etc) and data text-files (GWWQS_RT_NW_10_001.txt etc).

2.3.2 Analysis of Acoustic Noise

The manufacturer's acquisition software is optimised for detecting the seabed echo. This tends to amplify the acoustic returns in the lower half of the water column, including the vessel's flow noise (random signal generated by water passing across the sonar's transducer).

Using the manufacturer's acquisition display, the acoustic structure of the water column was seen most clearly when the vessel stopped and when the swath

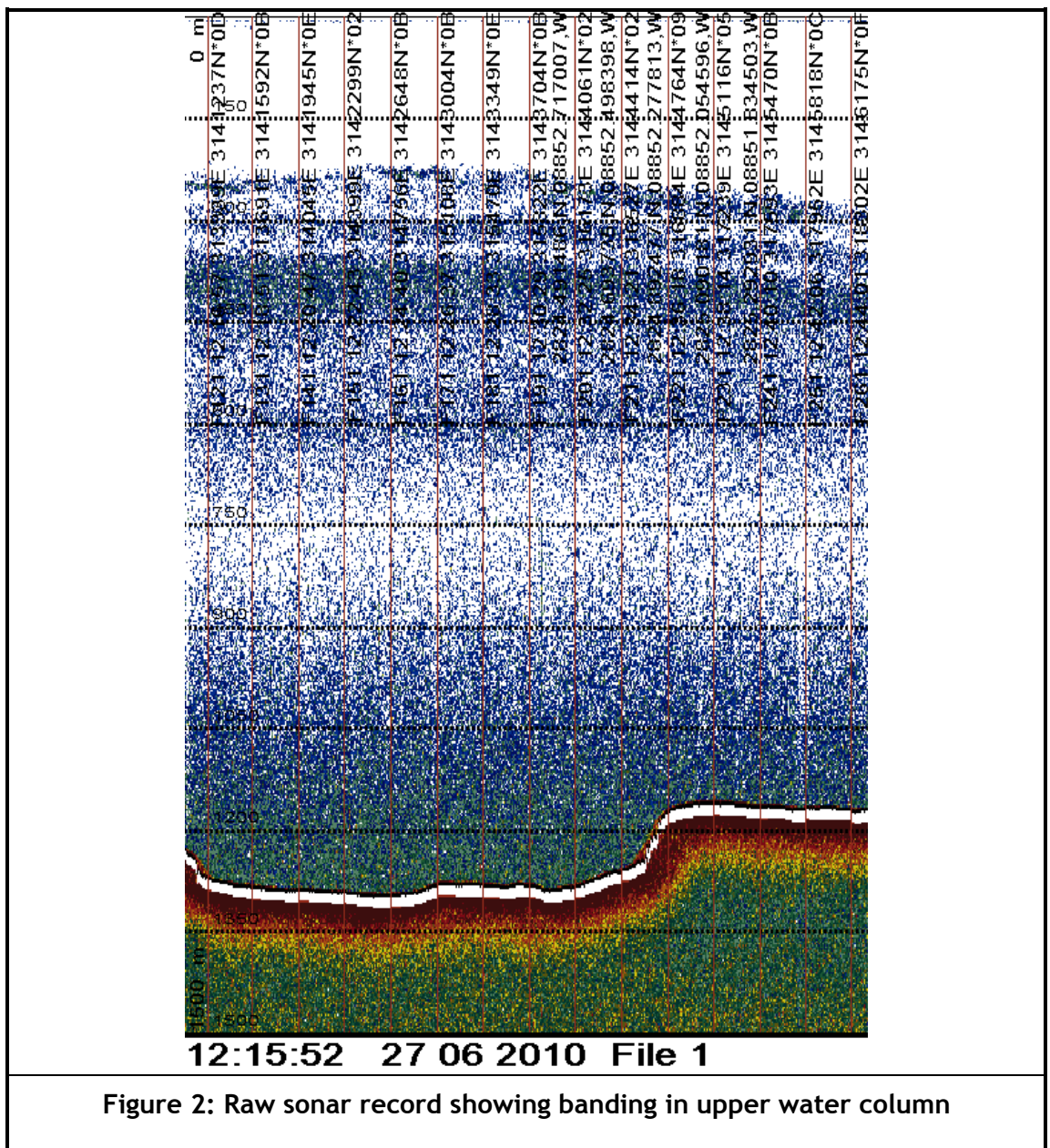
bathymetry system was switched off. The vessel was operated at low speed (about 5knots) to optimize data quality along survey lines. Water flowing over the transducers affects the quality of the recorded signal.

The main consistent features in the water column are sub-horizontal layers of high backscatter, typically between the water surface and 800m depth.

The oil has been reported to accumulate mainly below 1000m depth.

2.3.3 Common Features

The main acoustic features can be related to the density structure in the water column down to around 800m water depth. Sub-horizontal bands represent plankton layers, some of which migrate through the water column on a diurnal basis.

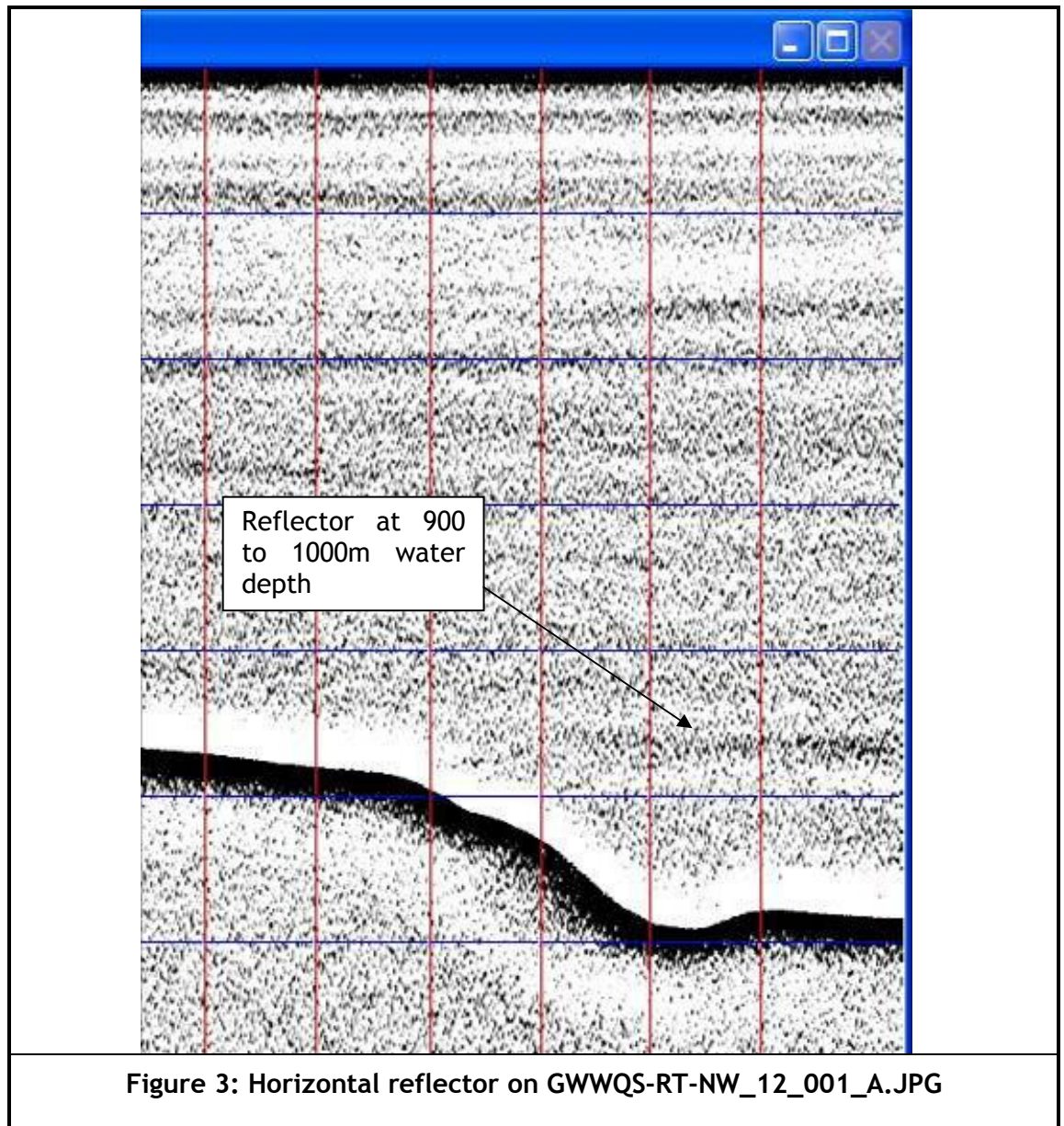


2.4 Appendix D, Sonar Data Presentation

Sonar data was filtered and displayed using EGS CView signal processing software. The processed sonar data has been presented in Appendix E as screen dumps.

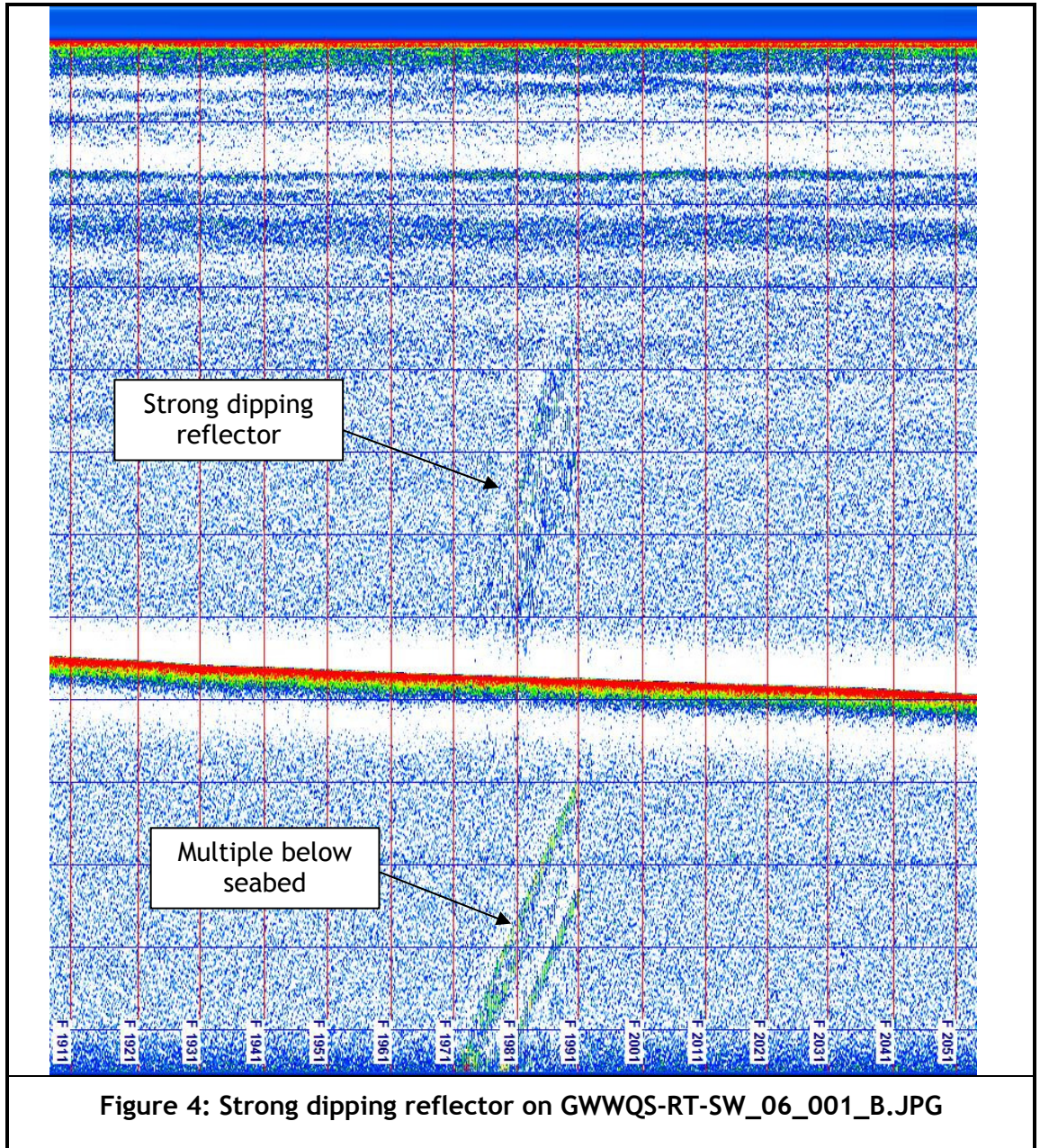
Anomalies consist of reflective bands or events below around 800m water depth. The events observed are tabulated in Appendix D ([Acoustic Scatter Zones rev 0.xls](#)).

An example of such a reflector is given below



The reflectors observed were generally weak and discontinuous, and showed little continuity from line to line. No significant horizontal reflectors were observed below 1000m water depth.

One very strong dipping reflector was observed on line GWWQS_RT_SW_06_001.raw. This was the closest approach to MC252 and there were numerous vessels in this area engaged on spill containment work. The reflector is likely to have been associated with towed underwater gear since it was not observed on the adjacent line and has an anomalous multiple below the seabed, as illustrated below.





2.5 Appendix E, Mapping of Seabed Backscatter Intensity

Two lines offset 18 and 20km from MC252 were surveyed in the southwest quadrant using the EM12 multibeam. The objective was to determine whether the backscatter data indicated any hydrocarbons on the seabed.

The raw data files are provided in Appendix E. The file name structure is:

xxxx_ddmmyy_hhmmss_raw.all

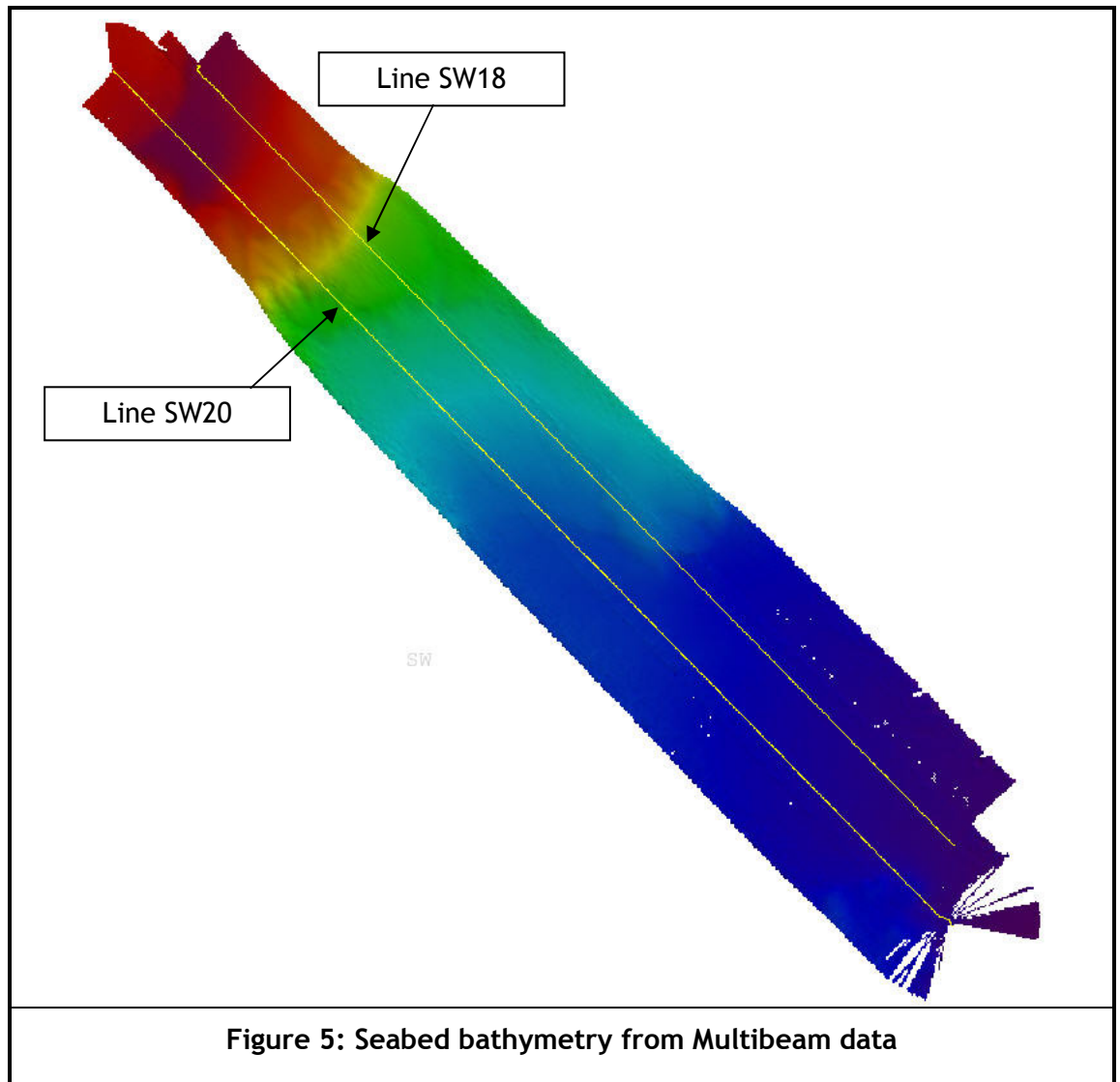
where:

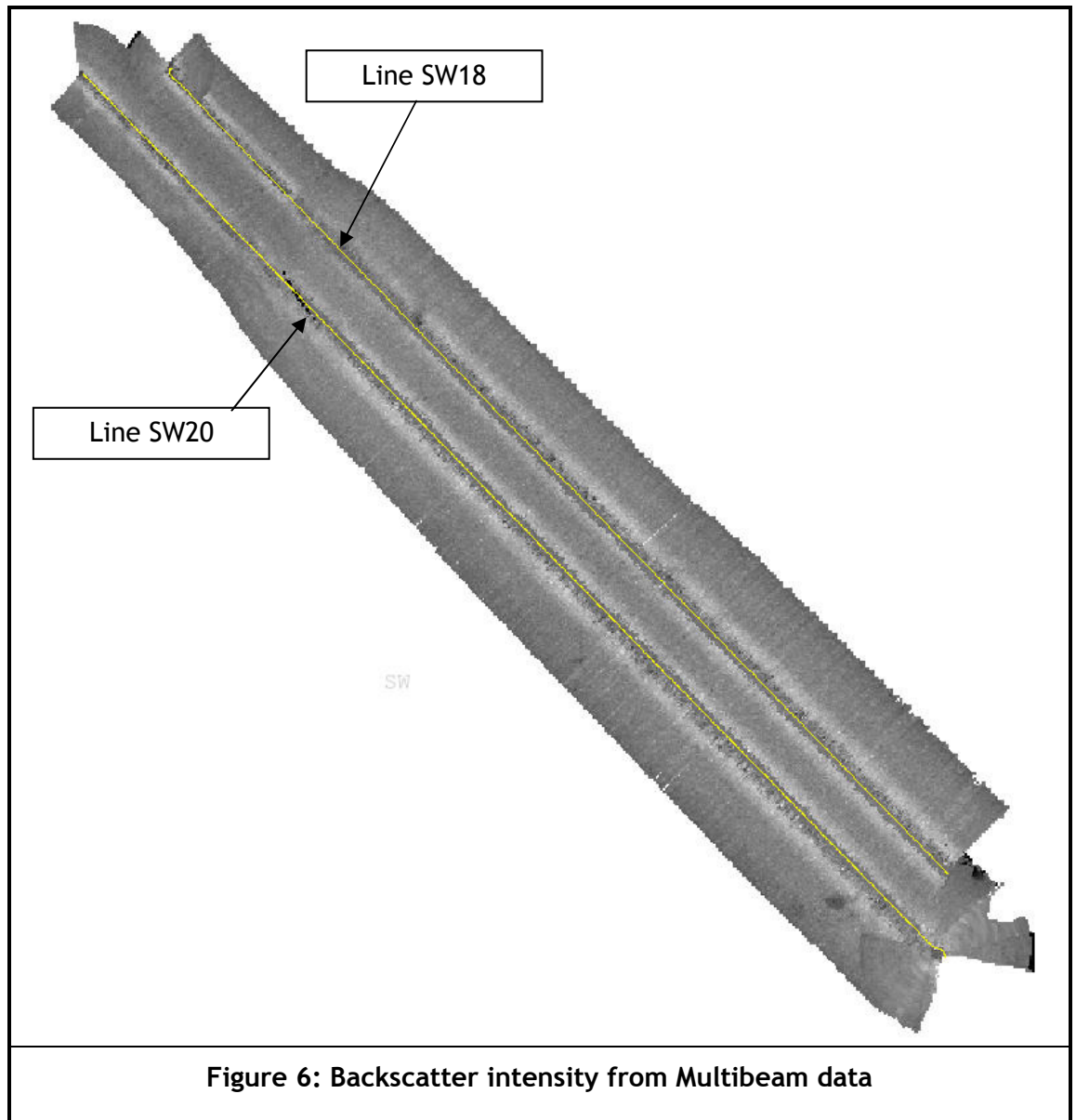
- **xxxx** is a sequential file number;
- **ddmmyy** is the day-month-year of start of file;
- **hhmmss** is the hour-minute-second of the start of file (UTC);
- **raw.all** indicates that it is the raw data file.

(Note that these files names are assigned directly by the acquisition software.) The information in the files is the raw data from the manufacturer's acquisition software, taken directly from the logging computer. No processing or any other alteration.

The navigation data is embedded in these files: the data structure is documented in the manufacturer's instrument manual.

The data have been processed using an industry-standard hydrographic survey processing package, Caris HIPS, to the point where drawings of seabed levels and backscatter intensity can be prepared. The derived seabed sounding plot is presented in Figure 5 below and the backscatter intensity is illustrated in Figure 6 below.





No anomalous features were seen on the backscatter intensity plots, suggesting that no large quantities of oil have accumulated on the seabed. At this stage, the main purpose of collecting this information is as a baseline of measurements that can be used for later comparison, to allow changes to be monitored over time. For this reason, the files have been archived, pending possible repeat traverses at a later stage.

3 ENVIRONMENTAL OBSERVATIONS & MARINE ACTIVITIES

3.1 Meteorological Observations

Regular environmental and meteorological observations were recorded during the survey, including sea state, swell, atmospheric pressure and wind velocity. These observations are included in the Daily Progress Reports.

3.2 Bridge Logs, Appendix F

3.2.1 Bridge Logs

The watch crew working on the bridge of the survey vessel recorded observations of marine activities and of wildlife. The logs are presented in Appendix F.

3.2.2 Marine Activities Log

Other vessels that passed by or were working close to the survey vessel were recorded in the Marine Activities Log, except in the area around MC252, where numerous vessels are continuously present. Details of the vessels were taken from the AIS. This is presented as one of the tabs in the Bridge Logs record, Appendix F.

3.2.3 Wildlife Observations

Wildlife seen from the survey vessels was logged in the Wildlife Observation Log. This is a separate tab in the Bridge Logs, Appendix F. The wildlife included a few dark-coloured dolphins observed close to Port Fourchon, a few birds and a number of flying fish.

There were no observations of dead creatures or of creatures behaving in an erratic or distressed fashion that could indicate being affected by an oil plume.