TIME LINE OF GEOPHYSICAL SOUND-PRODUCING OPERATIONS

MAY-JUNE 2008

M/V Teknik Perdana, Offshore NW Madagascar

INTRODUCTION

ExxonMobil Northern Madagascar (Ampasindava) Holding Limited (EM) contracted with TL Geohydrographics Pte. Ltd. (TL) to conduct a shallow site survey to verify the Sifaka site was safe for drilling an exploration well. The Sifaka site was located in the Ampasindava Block, off the coast of Northwest Madagascar. The contractor was hired to obtain 2D high-resolution digital seismic data, single beam and multibeam echo sounder (SBES and MBES, respectively) that would be used to identify potential shallow drilling hazards.

EM contracts for marine operations are separated into two parts: 1) Mobilization /demobilization and 2) geophysical operations. The geophysical operations phase begins when the first acceptable production shot is made. In this case the first production shot occurred on June 3, 2008. EM was notified about a nearby mass-stranding of melon-headed whales and shut down operations on June 6, 2008.

The following summarizes information on the equipment used on the vessel, movement of the vessel and the timing of the use of the sound sources. During the geophysical operations phase, EM has significantly greater control of vessel when conducting operations and owns the data generated. Therefore, for this survey, EM has best information during time of geophysical survey operations June 3 through 6. The geophysical operator voluntarily provided information during mobilization phase between May 29 and June 2. Between information and data provided by the contractor during the mobilization phase and the information from the survey, a time-line was created and is presented below.

Local time in Madagascar is GMT + 3 hours. Some of the data below is presented in local time consistent with the ship reports. Others are discussed in GMT as recorded and provided to EM. Early communications did not always make this distinction clear. This report attempts to clarify this issue.

EQUIPMENT

Information from manufacturers' specifications

<u>Deep Water Multibeam Echo Sounder</u>

The TL Perdana was equipped with a Kongsberg Simrad EM120 multi-beam echo sounder. The EM 120 has a nominal sonar frequency of 12 kHz with an angular coverage sector of up to six times water depth and 191 beams per ping. Full electronic compensation is provided for pitch, roll, and yaw stabilisation.

With a depth range of 20 to 11,000 meters, the EM 120 is designed for hydrographic mapping to full ocean depth.

Shallow Water Multibeam Echosounder

The TL Perdana was also equipped with a Kongsberg Simrad EM1002 multi-beam echo sounder. The EM1002 has a nominal sonar frequency of 95 kHz. It has 111 beams per ping and a coverage sector up to 150 degrees (usable up to 190 degrees).

Single Beam Echo Sounder

The TL Perdana was equipped with a Kongsberg Simrad EA600 echo sounder. The EA 600 single beam echo sounder operates up to four transceivers simultaneously. For improved performance, they are installed close to the transducers and linked to the combined display and processor with a single data cable. Available frequencies span from 12 to 710 kHz. A single beam echo sounder is employed at all times while vessel is working or in transit

2D High Resolution Seismic Source

The TL Perdana was equipped with a 760 cu in source array. The array consists of 4 x 40 cu in I/O sleeve guns and 4 x 150 cu in Sodera G guns, suspended at a depth of 4 metres. The airguns are charged to a pressure of 2000 psi and fired at 18.75m intervals. As the vessel travels at a speed of approximately 4.5 knots the array is fired at approximately 8 second intervals. Firing time and gun synchronisation are controlled by a Syntrak GCS 90 gun controller.

MOVEMENT OF VESSEL

Attachment 1 shows the trackline of the vessel from mobilization from the port of Diego Suarez on May 28, 2008 through cessation of geophysical operations on June 6. Several representative track points are included on the plot.

According to the ship report, the vessel left the port of Diego Suarez on May 28, 2008 in the early afternoon (12:40 hours, local time = GMT+3). It arrived at the Sifaka site and began preparation to start up survey operations at 11:30 hours on May 29. This included water column conductivity, CTD profile and calibration of the deep water MBES system (12 kHz). Due to lack of key equipment (acceptable breathalyzer), MBES calibration was stopped at 16:31 hours on May 29. The vessel was sent to the port of Mahajanga on May 30 to obtain equipment.

The vessel left the port of Mahajanga on June 2 and returned to the Sifaka site arriving at 22:30 hours. The vessel began preparation including deployment of streamers for seismic operations on June 3. Geophysical operations including 12 kHz MBES and airguns began at 16:17 hours local time on June 3 as reported in the Ship Report. Note in the MMO report, GMT is used, which is local time minus 3 hours. EM was informed about the stranding and operations were ceased on 6-June at 1940 hours.

TIMING OF SOUND SOURCE OPERATION

Deep Water Multi-Beam Echosounder (12 kHz)

Transit between Diego Suarez and Sifaka block

The deep water model MBES (12 kHz) was used during a portion of the mobilization from Diego Suarez to the Sifaka site on May 29. This is shown in Attachments 2 and 3. Operation of the MBES was between 02:44 until 09:30 GMT with about a 10 minute shutdown at 06:06 hours GMT (Attachment 3). The vessel position when this tool was turned on during transit is indicated in Attachments 2, 3 and 4. We note that based on the MBES data collected and plotted here, that the vessel appears to have arrived at the Sifaka block earlier than shown in the ship report. However, these times should be corrected to local time by adding 3 hours to be comparable to the ship reports.

Calibration at Sifaka Site

MBES calibration at Sifaka Site was begun at 11:56 on May 29 but was terminated due to lack of key equipment. Attachment 3 shows the vessel position when calibration was taking place.

The time of operation of the 12 kHz MBES during this calibration is summarized below:

MBES CALIBRATON ON MAY 29, 2008

Begin time – GMT *	End time-GMT*	Duration
11:56	12:10	14 Minutes
12:48	13:03	15 Minutes
13:33	13:53	20 Minutes
14:21	14:35	14 Minutes
15:02	15:17	15 Minutes
15:33	15:47	14 Minutes
16:19	16:31	12 Minutes

* The times in these tables are based on the spreadsheets in the second submission to ONE. Add three hours to obtain values for local time.

The calibration was terminated by EM and the vessel instructed to stop all operations pending having the right equipment on board. The vessel was deployed to Mahajanga to obtain this equipment. No data were logged using deep water MBES (12kHz) during transit to or from Mahajanga.

Shallow Water MBES (95 kHz)

In shallower water (<300 m), model EM1002 multibeam shallow water operating at 95 kHz was used at the Mahajanga anchorage on June 2. The location of this is shown in Attachments 2 and 4.

Geophysical Operations: Airguns and 12kHz MBES concurrently

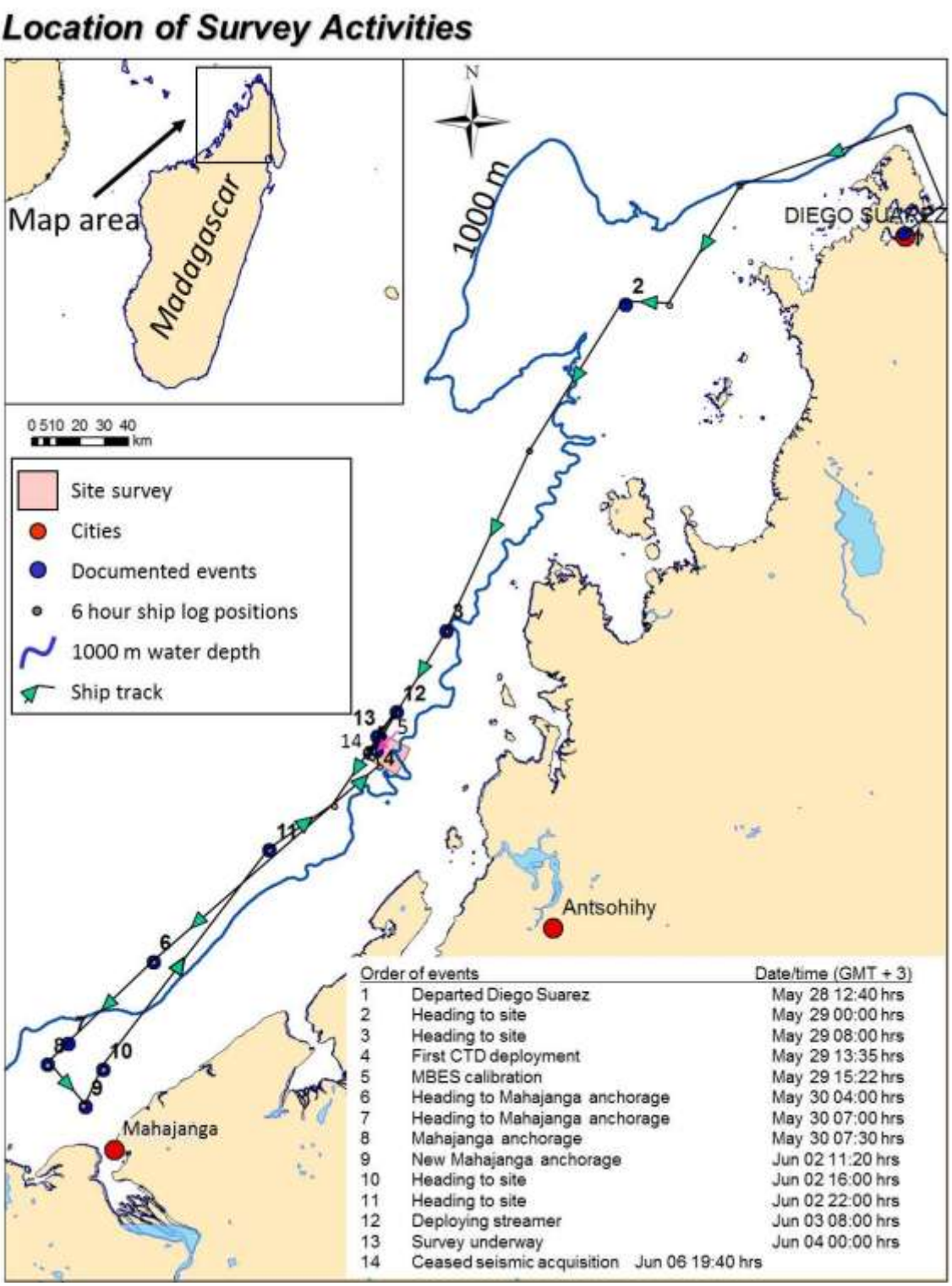
Seismic data collection using air guns as the source requires the deployment of a streamer to record the sound data. Initial deployment of this streamer is time consuming as the buoyancy of the streamer cable must be "balanced" or adjusted to work properly. The streamer was first deployed around midnight on June 2 and continued into the early hours of June 3.

Airguns were first deployed at 1617 hours on June 3 and were shut down on June 6, when EM was informed of the whale stranding. This timing is confirmed by MMO reports. Note the MMO report uses GMT (3 hours must be added to times in MMO report to have consistent basis with ship report). MMO's were aboard the vessel from the time it left Diego Suarez on May 28. They recorded the operations aboard the ship and implemented JNCC guidelines for airgun operation. The MMO reports are provided under separate cover.

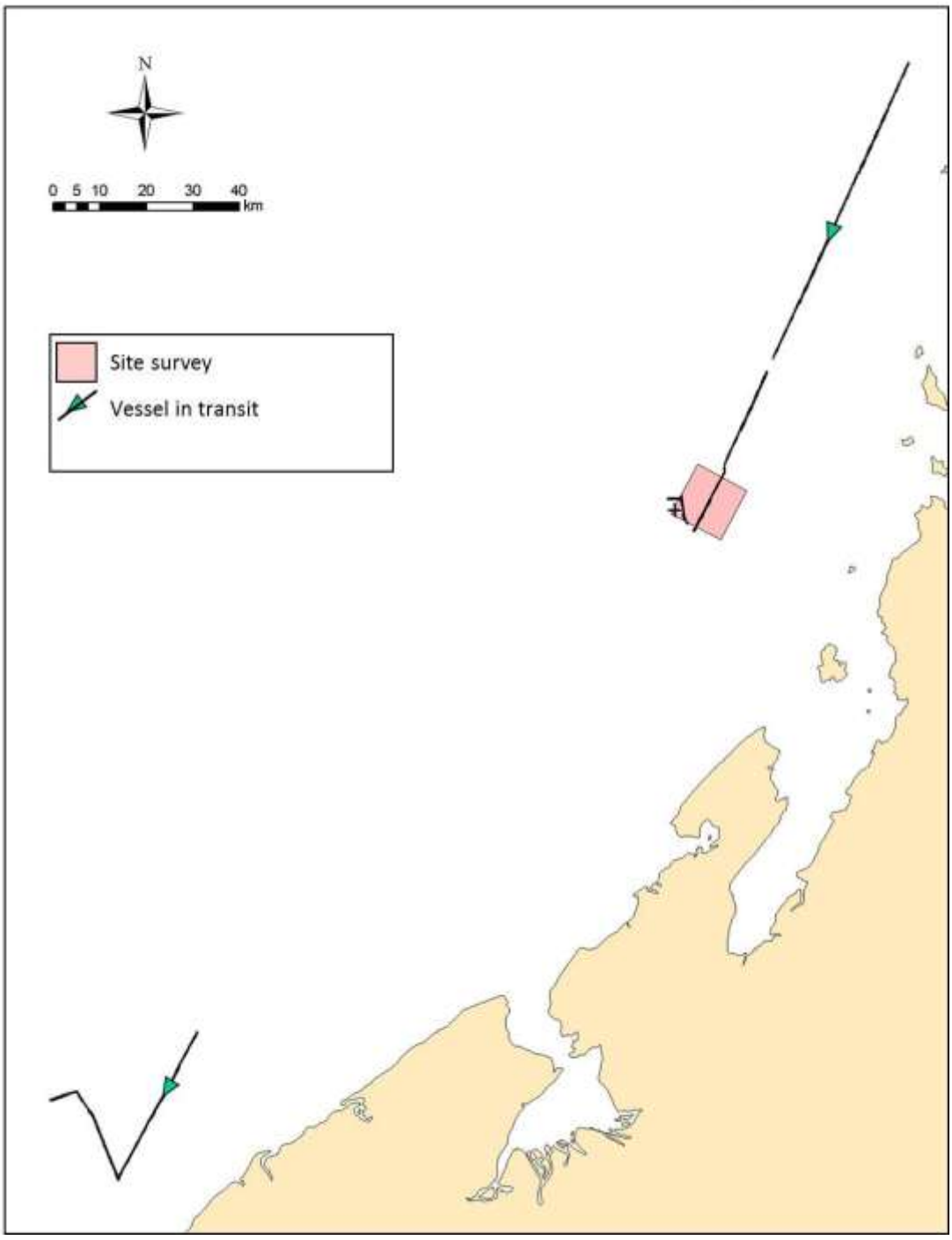
The Government of Madagascar representatives aboard vessel confirmed this directly to the Malagasy government.

Multi-beam Echosounder (12 kHz)

During geophysical operations, the deep water (12 kHz MBES) was used during the same time period as airguns between June 3 and June 6. The location of all the geophysical operations was on the Sifaka Block and appears as dark rectangles on Attachment 4.

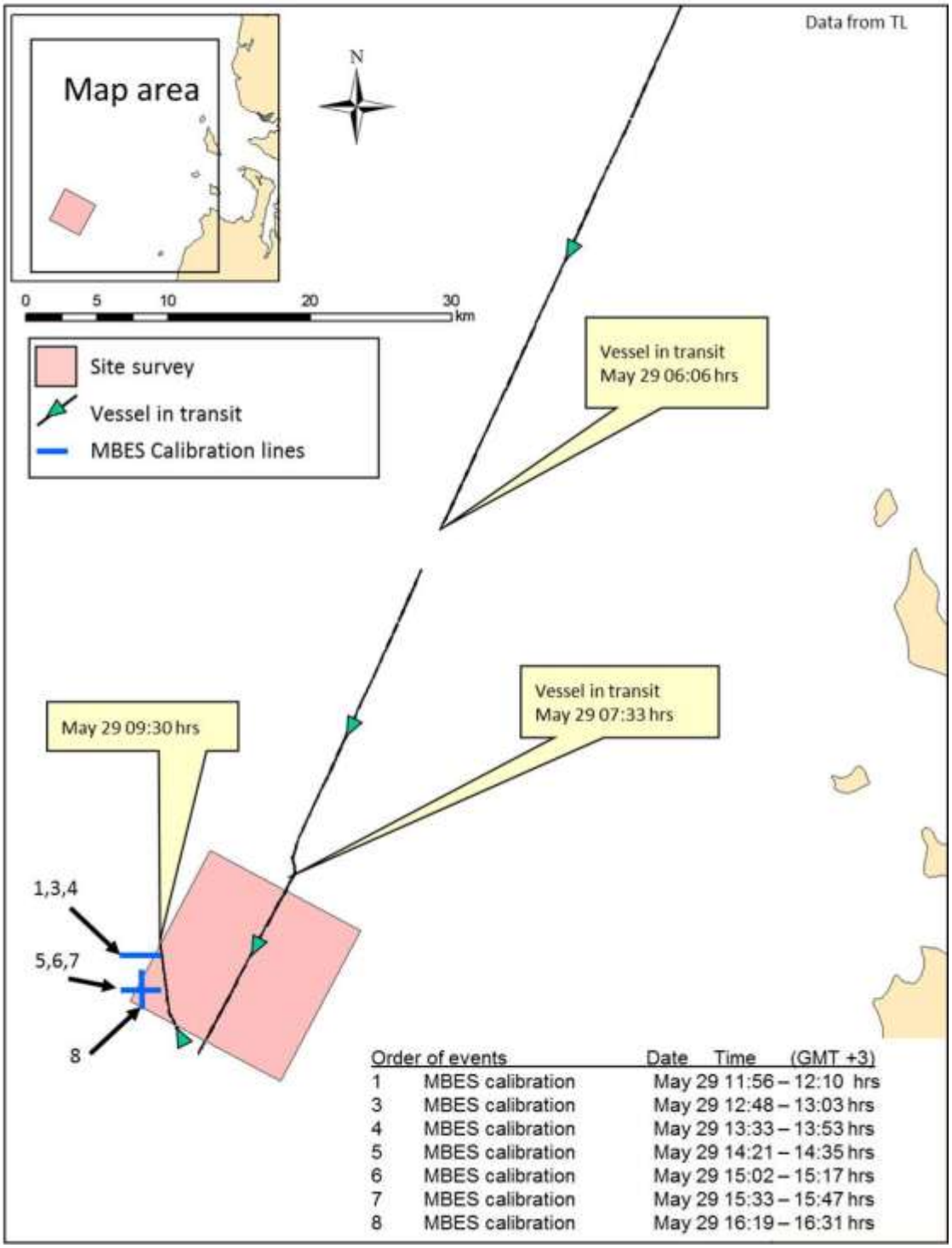


Attachment 1: Vessel activities from leaving the port of Diego Suarez until cessation of geophysical survey. Times on this chart are shown in local time.

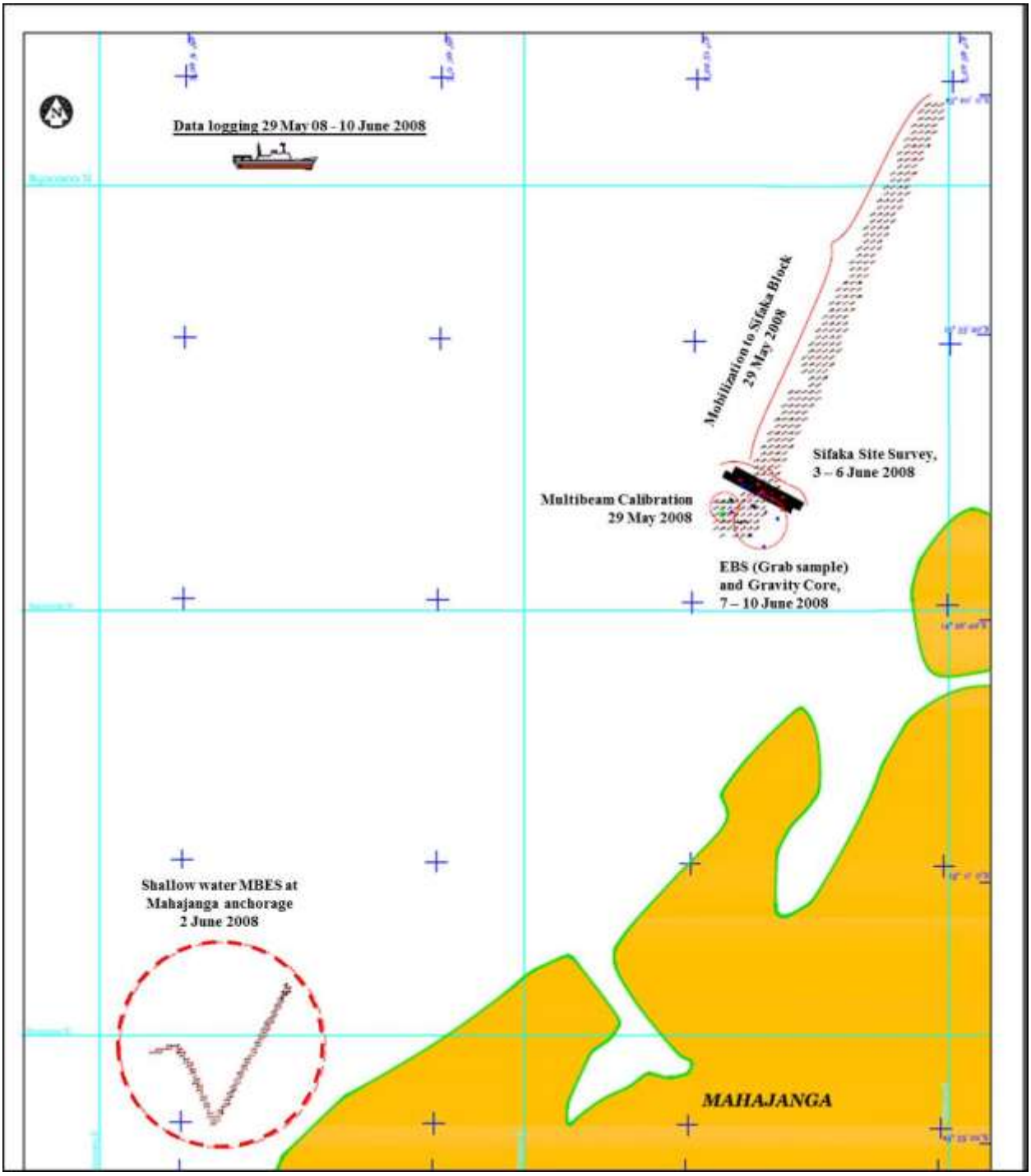


Attachment 2: Location of MBES data acquisition during mobilization phase. The track in the upper right is during vessel transit from Diego Suarez to the Sifaka Block. The 12 kHz MBES was used during this leg. The track on the lower left of the plot is near the anchorage at Mahajanga. This was acquired near the shallow water anchorage using a 95 kHz echosounder.

Location of MBES Calibration



Attachment 3: Location and timing of MBES calibration exercises on May 29, before the vessel was ordered to standby at Mahajanga due to lack of equipment. Note that all the times on this chart are GMT. The insert is not labeled correctly.



Attachment 4: MBES data logged between May 29 and June 6 2008