



**National
Oceanography Centre**

NATURAL ENVIRONMENT RESEARCH COUNCIL

National Oceanography Centre

Cruise Report No. 07

RV Knorr Cruise KN200-4

13 APR-03 MAY 2011

RAPID Mooring Cruise

Principal Scientists

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2011

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| ABSTRACT <p>This report describes the mooring operations conducted during RV <i>Knorr</i> cruise KN200-4 between 13 April and 3 May 2011.</p> <p>These mooring operations were completed as part of the United Kingdom Natural Environment Research Council (NERC) funded RAPID-WATCH Programme to monitor the Atlantic Meridional Overturning Circulation (MOC) at 26.5°N. The primary purpose on this cruise for the UK team was to service the RAPID Western Boundary moorings while the US teams worked on the Western Boundary Time Series project and the RAPID-MOCHA Western Boundary moorings.</p> <p>Cruise KN200-4 was from Port Everglades, Florida to Port Everglades, Florida and covered the Western Boundary moorings deployed on RB0901 and OC459. This cruise was the ninth annual refurbishment of the Western Boundary section of an array of moorings deployed across the Atlantic in order to continuously observe the MOC. This array will be further refined and refurbished during subsequent years.</p> <p>The instruments deployed on the array consist of a variety of current meters, bottom pressure recorders, and CTD loggers, which, combined with time series measurements of the Florida Straits Current and wind stress estimates, will be used to determine the strength and structure of the MOC at 26.5°N.</p> <p>(http://www.noc.soton.ac.uk/rapid)</p> | |
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1 Scientific and Ship's Personnel

| Ship's Crew | |
|--------------------|------------------------------------|
| <i>Name</i> | <i>Position</i> |
| Adam Seamans | Master |
| Deidra Emrich | Chief Mate |
| Jennifer Hickey | 2 nd Mate |
| Michael Chretien | 3 rd Mate |
| William Dunn | Bosun |
| Jose Andrade | Able Seaman |
| Kevin Butler | Able Seaman |
| Susan Coleman | Able Seaman |
| Michael Singleton | Ordinary Seaman |
| Paul St. Onge | Ordinary Seaman |
| Stephen Walsh | Chief Engineer |
| Piotr Marczak | 1 st Assistant Engineer |
| Wayne Sylvia | 2 nd Assistant Engineer |
| Joseph Bastoni | 3 rd Assistant Engineer |
| Rogelio Fong | Oiler |
| Michael Gaylord | Oiler |
| James Proctor | Oiler |
| Russell Adams | Electrician |
| Bobbie Bixler | Steward |
| Erskine Goddard | Cook |
| Anthony Reveira | Messman |
| Anthony Skinner | Comm/ET |
| Amy Simoneau | SSSG |
| Anton Zafereo | SSSG |

Table 1.1 Details of ship's crew on cruise KN200-4.

| Scientific and Technical | |
|-----------------------------------|--|
| <i>Name</i> | <i>Institute</i> |
| William Johns (PSO, US) | Rosenstiel School of Marine and Atmospheric Sciences, University of Miami (RSMAS) |
| Christopher Meinen (Co-chief, US) | National Oceanic and Atmospheric Administration (NOAA)/Atlantic Oceanographic and Meteorological Laboratory (AOML) |
| Robert McLachlan | National Marine Facilities Division (NMFD) |
| Steve Whittle | NMFD |
| Pedro Pena | AOML |
| Eleanor Frajka-Williams (PSO, UK) | National Oceanography Centre (NOC) |
| Erik van Sebille | RSMAS |

| | |
|--------------------|--|
| David Childs | NMFD |
| Thomas Roberts | NOC |
| Colin Hutton | NMFD |
| Darren Rayner | NOC |
| Christopher Hughes | School of Ocean and Earth Sciences, University of Southampton |
| Rigoberto Garcia | NOAA/AOML |
| Kyle Seaton | NOAA/AOML |
| Kyle McDermott | Woods Hole Oceanographic Institute |
| Rob Jones | RSMAS |
| Marcus Graham | RSMAS |
| Adam Houk | RSMAS |
| Greta Leber | RSMAS |
| Andy Stefanick | NOAA/AOML |

Table 1.2 Details of science personnel on cruise KN200-4.

2 R/V Knorr

Summarized from the www.whoi.edu website:

The R/V Knorr is owned by the U.S. Navy and operated by WHOI for the ocean research community. The R/V Knorr was launched in 1968, delivered to Woods Hole in 1970, and completely overhauled in 1991.

| | |
|----------------|---------------------------------------|
| Length | 279 feet (85 m) |
| Beam | 46 feet (14 m) |
| Draft | 16.5 feet (5 m) |
| Laboratories | 2,756 sq feet |
| Cruising speed | 11 knots |
| Cruising range | 12,000 nm |
| Fuel capacity | 160,500 gallons |
| Displacement | 2,685 LT |
| Endurance | 60 days |
| Complement | 22 crew, 32 scientists, 2 technicians |

Table 2.1 Operating characteristics of the R/V Knorr.

Computing

The mac mini hydrosea5 was used to collect and process data. It was equipped with a standalone Matlab license for processing. Additional login screens were setup to allow multiple users to login and process data. A wireless connection between the mac mini and PCs was used to transfer raw data from the PCs to the mac mini. Hydrosea5 was backed up using Time Machine.

A Canon flatbed scanner was brought on the cruise for scanning of hand-written logsheets. The ship was equipped with several color and black and white printers that could be used by the science party.

3 Itinerary

Depart Port Everglades, FL 13th of April 2011, arrive Port Everglades, FL 3rd May 2011.

4 Acknowledgements

We would like to thank the officers and the crew of the R/V Knorr for their expert and cheerful work in safely recovering and deploying moorings. The NMFD technicians were efficient and careful, successfully executing a complex set of mooring operations. Thanks as well to the chief scientist Bill Johns, and co-chief Chris Meinen, for a well-organized cruise.

5 Introduction

The RAPID-MOC observing system has been operational since spring 2004. The purpose of this cruise was to recover and redeploy the western boundary mooring sub-array deployed off Abaco Island, Bahamas.

This cruise is the 22nd in total since spring 2004. The cruises to date are shown in Table 5.1. The project web site is <http://www.noc.soton.ac.uk/rapidmoc>. The RAPID-MOC programme was completed and has now moved into a second phase (NERC Directed Programme RAPID-WATCH <http://www.noc.soton.ac.uk/rapid>) through to 2014.

5.1 Scientific Background

The Atlantic Meridional Overturning Circulation (AMOC) at 26.5°N carries a northward heat flux of 1.3 PW. Northward of 26.5°N over the Gulf Stream and its extension, much of this heat is transferred to the atmosphere and subsequently is responsible for maintaining UK climate about 5°C warmer than the zonal average at this latitude. However, previous sparse observations did not resolve the temporal variability of the AMOC and so it is unknown whether it is slowing in response to global warming as suggested by recent model results. In 2004 NERC, NSF and NOAA funded a system of observations in the Atlantic at 26.5°N to observe on a daily basis the strength and structure of the AMOC. Two papers ([*Cunningham, et al., 2007*] and [*Kanzow, et al., 2007*]) demonstrated that not only does the system of observations achieve a mass balance for the AMOC, it reveals dramatic and unexpected richness of variability. In the first year the AMOC mean strength and variability is 18.7±5.6 Sv. From estimates of the degrees-of-freedom the year-long mean AMOC is defined with a resolution of around 1.5 Sv so abrupt changes would be readily identified and long-term changes will be measured relative to the 2004-2005 average.

The NERC contribution to the first four years of continuous AMOC observations was funded under the directed programme RAPID Climate Change. Following an international review of the system NERC will continue funding to 2014 under the programme RAPID-WATCH. The NSF and NOAA have also continued funding and commitments so that the system can continue operating at the same level of activity as during the period 2004-2008.

The objectives of RAPID-WATCH are: To deliver a decade-long time series of calibrated

and quality-controlled measurements of the Atlantic MOC from the RAPID-WATCH arrays and; To exploit the data from the RAPID-WATCH arrays and elsewhere to determine and interpret recent changes in the Atlantic MOC, assess the risk of rapid climate change, and investigate the potential for predictions of the MOC and its impact on climate.

The AMOC System

The 26.5°N Atlantic section is separated into two regions: a western boundary region, where the Gulf Stream flows through the narrow (80 km), shallow (800 m) Florida Straits between Florida and the Bahamas, and a transatlantic mid-ocean region, extending from the Bahamas at about 77°W to Africa at about 15°W (Figure 5.1). Variability in Gulf Stream flow is derived from cable voltage measurements across the Florida Straits, and variability in wind-driven surface-layer Ekman transport across 26.5°N is derived from QuikSCAT satellite-based observations. To monitor the mid-ocean flow we deployed an array of moored instruments along the 26.5°N section. The basic principle of the array is to estimate the zonally integrated geostrophic profile of northward velocity on a daily basis from time-series measurements of temperature and salinity throughout the water column at the eastern and western boundaries. Inshore of the most westerly measurement of temperature and salinity, the transports of the Antilles current and deep western boundary current are monitored by direct velocity measurements.

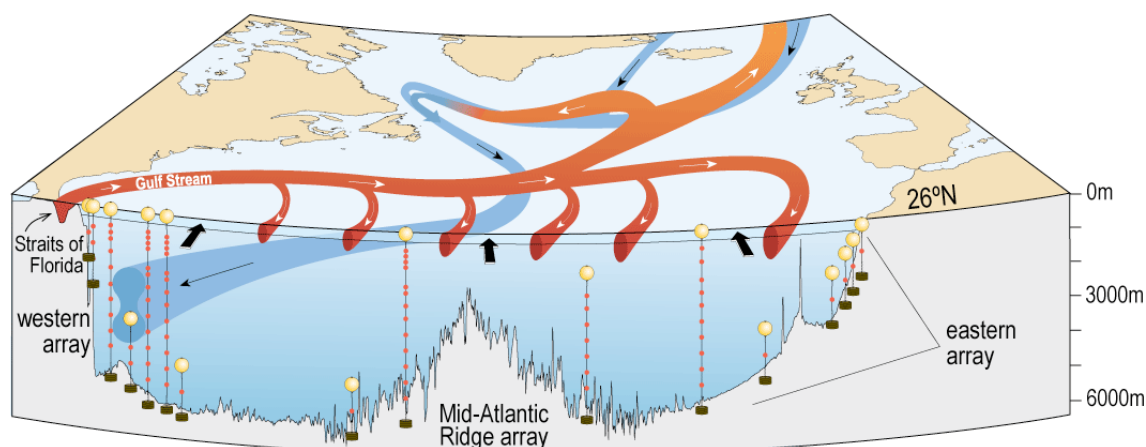


Figure 5.1 Schematic of the principal currents of the Atlantic Meridional Overturning Circulation. The vertical red lines across the Atlantic at 26.5°N indicate the main areas where moorings instrumented to measure the vertical density profile are located. The Gulf Stream transport is measured by submarine cable and the western boundary array includes current meters to directly measure transports of the shallow and deep western boundary currents. Bottom pressure recorders are located at several sites across the Atlantic to measure depth independent fluctuations of the basin-wide circulation. Figure based on one by Louise Bell and Neil White, CSIRO.

Rapid Mooring Cruise Report for KN200-4 – April – May 2011

| Cruise | Vessel | Date | Objectives | Cruise Report |
|---------|-----------------------|----------------|--|---|
| D277 | RRS Discovery | Feb - Mar 2004 | Initial deployment of Eastern Boundary and Mid-Atlantic Ridge moorings | RRS Discovery Cruise D277 and D278, Southampton Oceanography Centre, Cruise Report No. 53, 2005 |
| D278 | RRS Discovery | Mar 2004 | Initial deployment of UK and US Western Boundary moorings | RRS Discovery Cruise D277 and D278, Southampton Oceanography Centre, Cruise Report No. 53, 2005 |
| P319 | RV Poseidon | Dec 2004 | Emergency deployment of replacement EB2 following loss | Appendix in RRS Charles Darwin Cruise CDI170 and RV Knorr Cruise KNI82-2 National Oceanography Centre, Southampton, Cruise Report No. 2, 2006 |
| CDI170 | RRS Charles Darwin | Apr 2005 | Service and redeployment of the Eastern Boundary and Mid-Atlantic Ridge moorings | RRS Charles Darwin Cruise CDI170 and RV Knorr Cruise KNI82-2 National Oceanography Centre, Southampton, Cruise Report No. 2, 2006 |
| KNI82-2 | RV Knorr | May 2005 | Service and redeployment of UK and US Western Boundary moorings and Western Boundary Time Series (WBTS) hydrographic section | RRS Charles Darwin Cruise CDI170 and RV Knorr Cruise KNI82-2 National Oceanography Centre, Southampton, Cruise Report No. 2, 2006 |
| CDI177 | RRS Charles Darwin | Nov 2005 | Service and redeployment of key Eastern Boundary moorings | RRS Charles Darwin Cruise CDI177, National Oceanography Centre, Southampton, Cruise Report No. 5, 2006 |
| WS05018 | RV F. G. Walton Smith | Nov 2005 | Emergency recovery of drifting WBI mooring | No report published |
| RB0602 | RV Ronald H. Brown | Mar 2006 | Service and redeployment of UK and US Western Boundary moorings and Western Boundary Time Series (WBTS) hydrographic section | RV Ronald H. Brown Cruise RB0602 and RRS Discovery Cruise D304, Southampton Oceanography Centre, Cruise Report No. 16, 2007 |
| D304 | RRS Discovery | May - Jun 2006 | Service and redeployment of the Eastern Boundary and Mid-Atlantic Ridge moorings | RV Ronald H. Brown Cruise RB0602 and RRS Discovery Cruise D304, Southampton Oceanography Centre, Cruise Report No. 16, 2007 |
| P343 | RV Poseidon | Oct 2006 | Service and redeployment of key Eastern Boundary moorings | PS Poseidon Cruise P343 and P345, National Oceanography Centre, Southampton, Cruise Report No. 28, 2008 |
| P345 | RV Poseidon | Dec 2006 | Emergency redeployment of EB1 and EB2 following problems on P343 | PS Poseidon Cruise P343 and P345, National Oceanography Centre, Southampton, Cruise Report No. 28, 2008 |
| SJ06 | RV Seward Johnson | Sep - Oct 2006 | Recovery and redeployment of WB2 and US Western Boundary moorings and Western Boundary Time Series (WBTS) hydrographic section | Appendix G in RV Ronald H. Brown Cruise RB0701, National Oceanography Centre, Southampton, Cruise Report No. 29 |
| RB0701 | RV Ronald H. Brown | Mar - Apr 2007 | Service and redeployment of UK Western Boundary moorings and Western Boundary Time Series (WBTS) hydrographic section | RV Ronald H. Brown Cruise RB0701, National Oceanography Centre, Southampton, Cruise Report No. 29 |
| D324 | RRS Discovery | Oct - Nov 2007 | Service and redeployment of the Eastern Boundary and Mid-Atlantic Ridge moorings | RRS Discovery Cruise D324, Southampton Oceanography Centre, Cruise Report No. 34, 2007 |
| SJ0803 | RV Seward Johnson | Apr 2008 | Service and redeployment of the Western Boundary moorings | RV Seward Johnson Cruise SJ0803, National Oceanography Centre, Southampton, Cruise Report No. 37, 2008 |

| Cruise | Vessel | Date | Objectives | Cruise Report |
|---------|--------------------|---------------------|--|---|
| D334 | RRS Discovery | Oct - Nov 2008 | Service and redeployment of the Eastern Boundary and Mid-Atlantic Ridge moorings | RRS Discovery D334, National Oceanography Centre, Southampton, Cruise Report No. 38, 2009 |
| RB0901 | RV Ronald H. Brown | Apr - May 2009 | Service and redeployment of UK and US Western Boundary moorings and Western Boundary Time Series (WBTS) hydrographic section | RV Ronald H. Brown Cruise RB0901, National Oceanography Centre, Southampton, Cruise Report No. 39, 2009 |
| D344 | RRS Discovery | Oct - Nov 2009 | Service and redeployment of the Eastern Boundary and Mid-Atlantic Ridge moorings | RRS Discovery D344, National Oceanography Centre, Southampton, Cruise Report No. 51, 2010 |
| D345 | RRS Discovery | Nov - Dec 2009 | Recovery and redeployment of US Western Boundary moorings, and WBTS hydrographic section | Cruise report to be published |
| OC459 | RV Oceanus | Mar - Apr 2010 | Service and redeployment of UK Western Boundary moorings | RV Oceanus Cruise OC459-1, National Oceanography Centre, Cruise Report No. 01, 2011 |
| RB10-09 | RV Ronald H. Brown | Nov - Dec 2010 | Service and redeployment of WB4 that could not be completed on OC459 | Appendix in RV Oceanus Cruise OC459-1, National Oceanography Centre, Cruise Report No. 01, 2011 |
| D359 | RRS Discovery | Dec 2010 - Jan 2011 | Service and redeployment of the Eastern Boundary and Mid-Atlantic Ridge moorings | Cruise report to be published |
| KN200-4 | RV Knorr | Apr - May 2011 | Service and redeployment of UK and US Western Boundary moorings and Western Boundary Time Series (WBTS) hydrographic section | This report |

Table 5.1 Summary of RAPID MOC cruises.

5.2 Array Specification

The array as deployed in 2011 consists of a total of twenty-one moorings, twelve landers and two inverted echo sounders. Figures 5.2 and 5.3 are schematics showing each mooring and instrumentation in 2011. The eastern boundary moorings were serviced in the December-January cruise D359. Moorings are named in three sub-arrays. Western Boundary **WB#** with mooring number increasing to the east; Mid-Atlantic Ridge **MAR#**; Eastern Boundary **EB#**. The letter **H** is a historical reference to moorings originally intended to be HOMER profilers. Bottom landers instrumented with pressure recorders are indicated by **L** in the name. **ADCP** indicates an Acoustic Doppler Current Profiler mooring.

Western Boundary Sub-Array

At the western boundary, **WB2** is the pivotal mooring and provides a full-depth density profile very close to the western boundary “wall”. As from April 2011, WB2 comprises seventeen CTDs and eight current meters, whereas **WB1** comprises fifteen CTDs and four current meters. Inshore of WB1 there is **WBADCP** that comprises a Longranger ADCP at a depth of 600 m to measure the shallow Antilles current. East of WB2 is **WBH2** consisting of three CTDs and five current meters. At the normal offshore extent of the Deep Western Boundary Current (DWBC) is **WB4**, which comprises fifteen CTDs and nine current meters. Further offshore is **WB6**, comprising five CTDs, one current meter and two bottom pressure recorders – which combined with MAR0 measures the contribution to the MOC of deep water below 5200 m, including the Antarctic Bottom Water. There are six landers in this sub-array; two at the site of WB2; two at the site of WB4; and two at the site of WBADCP. Each lander comprises two BPRs.

In addition to the moorings listed above, the western boundary sub-array also contains three full depth moorings and four landers from the University of Miami, which were serviced on this same cruise. **WB0** comprises four CTDs, four current meters and an upward looking ADCP. **WB3** is 22 km east of WB2 and so acts as a critical backup in case of loss of WB2. WB3 consists of seven CTDs and current meters. Combined with the other inshore moorings it provides the thermal-wind shear and measured velocities from the core of the DWBC. **WB5** is located 500 km offshore and is instrumented with seventeen CTDs and provides the thermal-wind shear across the full width of the boundary currents including any recirculation.

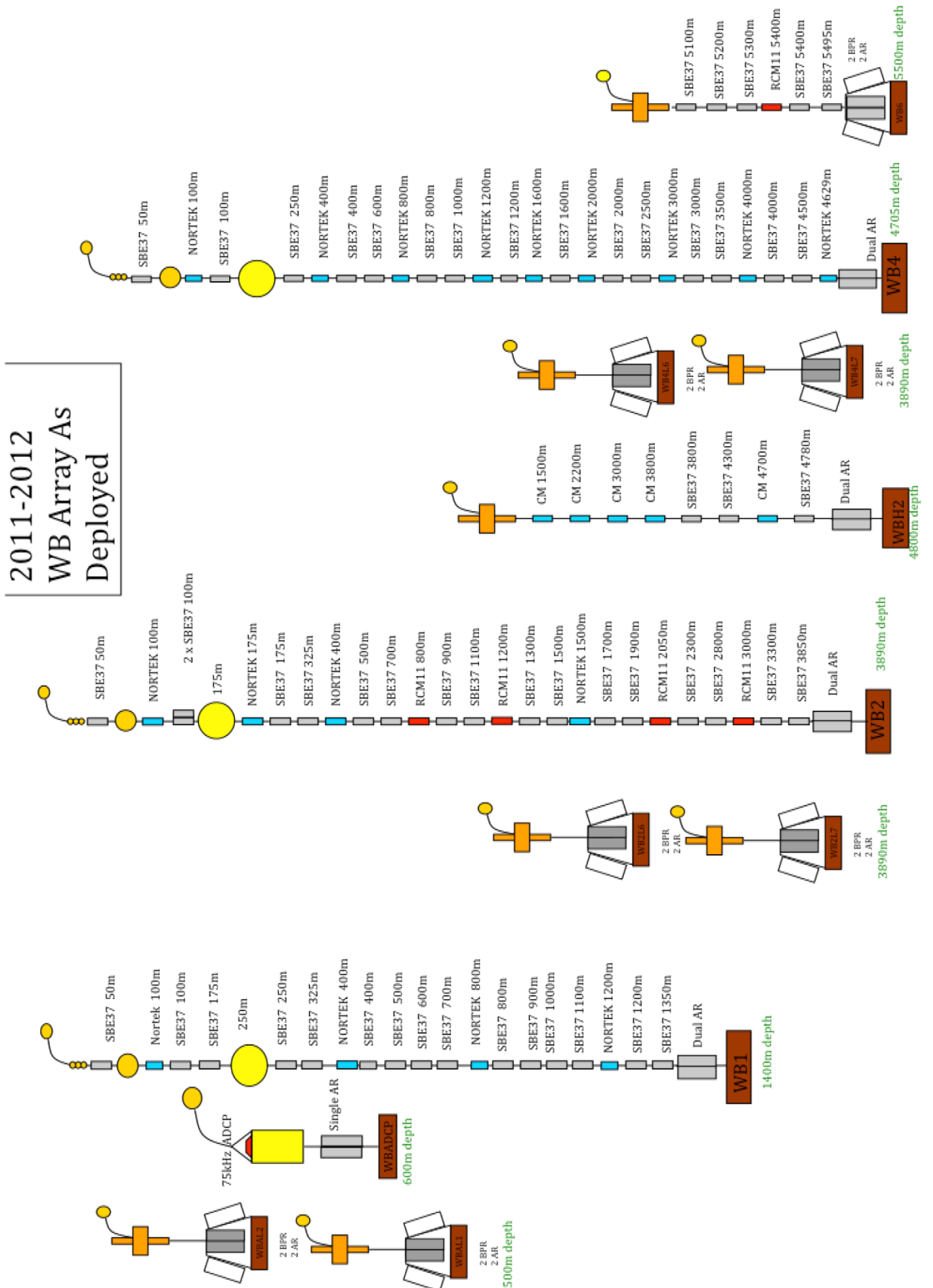


Figure 5.2 Western boundary moorings as deployed on Kn200-4.

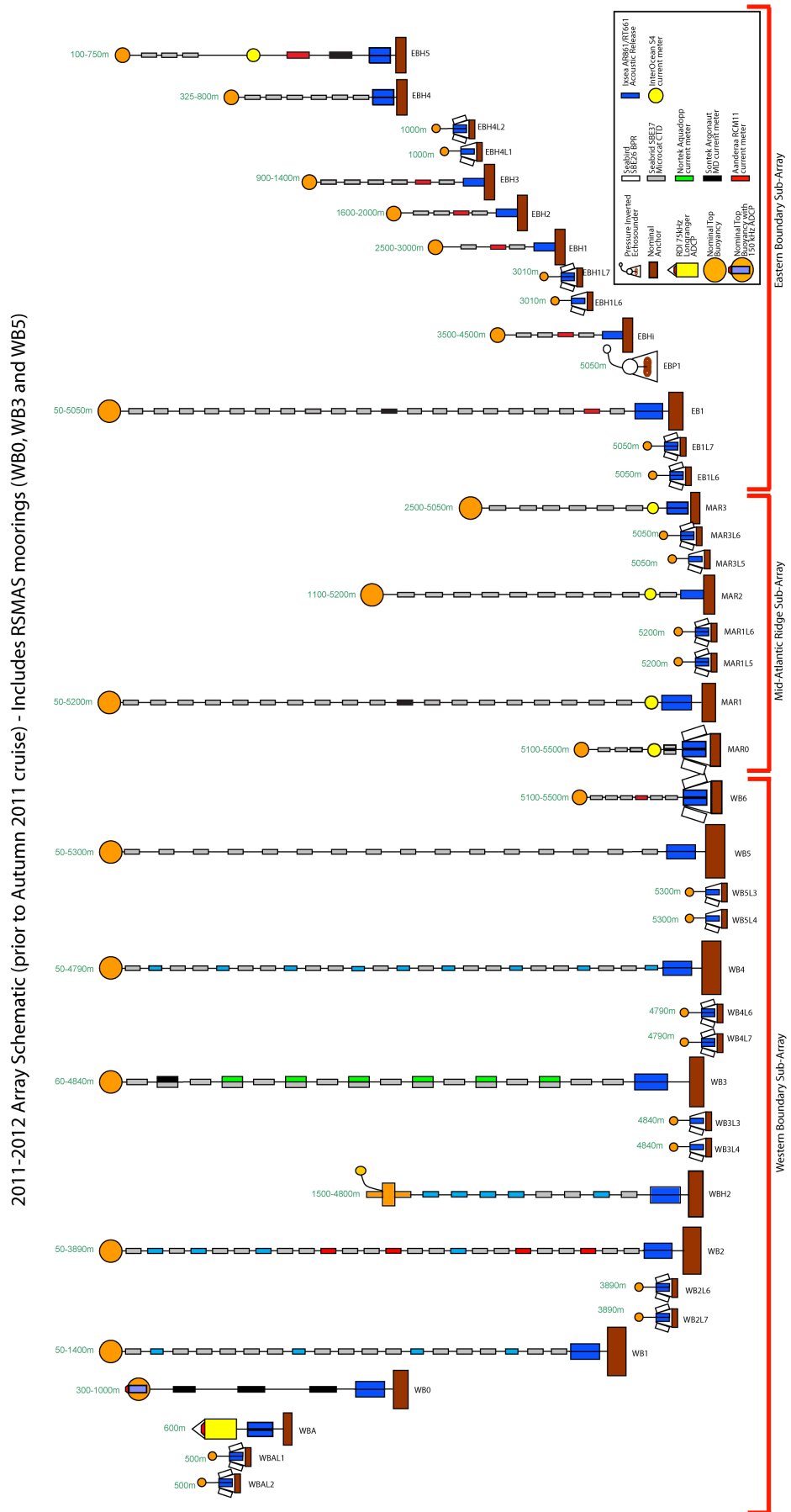


Figure 5.3 Array schematic after Kn200-4 cruise.

6 Diary of Events

E. Frajka-Williams

All times are local time unless specified.

Sunday, 10th April 2011

Eleanor, Darren and Chris travelled from Heathrow to Miami. Arrived in Miami at 17:30 local, drove to Ft. Lauderdale. (Mooring team arrived Friday.) Eleanor lost a filling in flight and had to find a dentist.

Monday, 11th April 2011

Loading and lab setup on the ship. We had some trouble getting to the ship as the berth had changed, but we were unaware. Additionally, access to the ship was only possible when escorted by someone carrying a TWIC card and a Ft. Lauderdale port pass (for \$75/week) or a merchant marine card. Onboard, Darren and Chris set up the computers and network. The moorings team unloaded gear and set up the lab. After some negotiation, lab space was allocated. One container was delayed and deferred until tomorrow. Eleanor got a temporary filling, as well as some spare in case the filling falls out again mid-cruise.

Tuesday, 12th April 2011

Final containers arrive. One box of five microcats was not shipped from the NOC so Darren reallocates the mooring array with the 45 microcats onboard, expecting to redeploy 5 that we will recover. All science party moved onboard.

Wednesday, 13th April 2011

We sailed just after 08:30; Beautiful weather, partly cloudy and warm but breezy. We are aiming to reach Freeport, Bahamas by 15:30 to clear customs before they close for the day. Customs were cleared quickly and without issue. The first CTD was started before dinner, and the primary and secondary sensors match very well.

Thursday, 14th April 2011

The short CTD section was completed Wednesday evening, and caldips started this morning at 10:00. The weather continues to be good, with very calm seas and a slight breeze. Four caldips were planned for today (cast 6-9), with most of the microcats onboard scheduled for these dips. The dips are only to 3500 m (cast 8 to 4000 m) so the deepest instruments are being reserved for two final caldips at the end of the hydrographic section. The first caldip was completed after lunch, and the next begun. The first two dips had the new 150 kHz LADCP package on it, which successfully returned data. Acoustic release tests were planned for the 3rd and 4th caldips. Shortly after the 3rd caldip began, it was recalled that the pinger wasn't turned off, so the package was brought back to the deck after 1000 m and the pinger removed. The CTD frame with microcats and releases was turned around and cast 8 restarted around 20:00. Casts 8 and 9 had UK microcats and releases only, and were done overnight.

Friday, 15th April 2011

Caldips 8 and 9 were completed overnight. One microcat was not turned on (or the date set incorrectly) and so will be re-dipped later. Microcat 3229 had a bad conductivity

cell, but it had recently been returned from Seabird, so appears not to have been fixed. Today the moorings team is doing some wire winding, and RCM servicing. The hydrographic section began. Moorings are scheduled to begin with WB6 on Thursday, 21st April.

Saturday, 16th April 2011

The hydrographic section and wire winding continue. In the evening, one cast had to be cut short (bottle stops skipped above 1000 m) due to the sighting of 3 flares. As the nearest ship, we were the first responders. It turned out to be a fishing vessel that had run out of fuel, so the Knorr acted as relay until a coast guard could respond, and then returned to the hydrographic section.

Sunday, 17th April 2011

The hydrographic section continues. Servicing RCMs.

Monday, 18th April 2011

The hydrographic section continues. Wire winding, building glass.

Tuesday, 19th April 2011

The hydrographic section continues. Weather is still good, but the forecast has heavy winds kicking in Wednesday afternoon (20 knots) and possibly higher on Thursday, with a low pressure region moving in from the east. Additionally, there appears to be a high pressure area with 35 knot winds to the northeast which will likely create swell for us.

Wednesday, 20th April 2011

Weather picked up this morning, so there was more activity tying things down in the lab. Hydrographic section continues, but is expected to end around midnight. Afternoon revision: Forecast was updated for some very bad weather (>30 knot winds) over the weekend, so we've dropped the last two hydrographic stations and released WB6 at 17:07 GMT (13:07 local) this afternoon. We'll continue with tomorrow's schedule today, hopefully finishing the second caldip (cast 37) in the wee hours of Thursday morning. Thursday we'll be at WB5 and possibly compress the two day recover-deploy from Friday-Saturday into all day Thursday, and continue west, away from the weather.

WB6 was successfully recovered. We used the ship's landtec winch to pull in the recovery line, and then switched to a block on the crane, which was also secured using two handlines to cleats. Recovery took 2.5 hours from time of first ranging to deck secure. The 5th caldip was set up (CTD cast 36) with pre-cal microcats for WB6 replacement, and some additional deep microcats for WB4.

The weather system is now being monitored as invest 91L.

WB6 was deployed, with a conservative setup distance of 0.5 nm at 01:37 GMT (21:37 local). We dropped the anchor at 01:56 GMT about 200 m off the target.

Thursday, 21st April 2011

We arrived at site E (WB5) around 10:00, and started mooring recovery just after lunch. The mooring was successfully recovered, followed by the lander surfacing after dinner. After cleaning the deck, the replacement lander was deployed. It was a late night. PIES telemetry continued until the early hours of the morning.

Friday, 22nd April 2011

WB5 replacement was deployed after breakfast, starting around 09:30, with triangulation finishing around 3pm. We left for WB4. The lander frame for WB4L was built in the afternoon, and winch and reeler set up for WB4 recovery tomorrow.

Saturday, 23rd April 2011

We arrive at WB4 site at 10:30, check winds and currents then move off by 0.5 nm to release it. Discussed with the bridge that we'd go to the site, and check the currents and wind speed, then move off by 0.5 nm for the release. We released the mooring around 11:15 local, then started pickup shortly after. However, due to the way the mooring was laying, we steamed for 50+ min before hauling. There was also some nearby traffic that was not responding to the bridge when they called. Mooring recovery was completed at 16:30 local, and the lander deployed before 18:00. A caldip of the WB5 microcats is scheduled for 20:00. The PIES deployment was delayed until tomorrow.

Sunday, 24th April 2011: Easter Sunday

We fired WB4L5 at 06:00 local, with a setup distance of 0.3 nm away. The lander surfaced at 07:13 local, behind us off the starboard side. After some maneuvering, it was all onboard at 07:55 local. After breakfast (08:15-11:30 local) we built the 8 strings of 5 rugby ball floats. It took over 3 hours for 5-7 people working continuously (except for a short tea break) to assemble them all. After lunch, preparation continues for WB4, with moving anchors and syntactic foam floats. Mooring deployment started with the first float in the water at 12:55 local. We were running against a current of 0.4-0.5 kts, so in the first 1 hr 10 min and 1200 m out, we only made 0.4 nm overground. After 3 hours of towing, the mooring was deployed at 18:30, followed by a triangulation of both WB4 and WB4L. It was discovered that the lander had moved more from its anchor drop than WB4 (0.23 nm for the lander, vs 0.17 nm for the tall mooring), suggesting that it is necessary to triangulate its position every time. CTD cast 39 proceeded overnight to caldip the microcats from WB4 recovery.

Monday, 25th April 2011

The RSMAS group recovered WB3 then WB3L, then redeployed WB3L. The weather has turned wet, with gray clouds everywhere, and raincoats for all the people working on deck. Overnight, PIES C was deployed, and a calibration cast done for the PIES.

Tuesday, 26th April 2011

Mooring deployment of WB3L started after breakfast. Weather is brighter today than yesterday, and dry, but not as sunny as it has been. After checking the sites for past deployments of WBH2, WB2 and WB1, sites were chosen for their redeployment. In particular, the site used for WBH2 on the Oceanus 459 spring 2010 cruise was some distance away from the target site, since the mooring was deployed before it was recovered. We will be using the previous deployment site (from RB0901) for WBH2, which is 26°29.08'N, 76°37.45'W. The site chosen for WB2 is in the middle of the past WB2 sites, at 26°30.8'N, 76°44.65'W. For WB1 it is 26°30'N, 76°49'W. Fallback for

WBH2 was 0.42 nm on RB0901 and 0.47 nm on OC459. Fallback for WB2 was 0.35 nm on RB0901 and 0.24 nm on OC459. Fallback for WB1 was 0.11 nm on RB0901 and 0.06 nm on OC459. In these cases, we'll pass the deployment site by 800 m (0.43 nm) for WBH2, 500 m (0.27 nm) for WB2 and 150 m (0.08 nm) for WB1.

WB3 deployment finished at 12:45. Watching to the bottom, then on to WBH2.

Wednesday, 27th April 2011

We deployed WBH2 after breakfast. Everything went quickly and smoothly. The usual setup distance of 2.5 nm was doubled to 5 nm because we were running with a 0.8 kt current. However, Rob asked for the ship to do 1.8 kt through water, which resulted in a fast time over ground. The mooring anchor was released shortly after 10:30. We planned to survey, but after watching it down, decided to move on to recover WB2 instead. We couldn't hear the releases at first, but it turned out it was because of the strong surface current, which was causing the transducer to lay out alongside the ship rather than hang down. We asked the bridge to drift, and were able to sound and release the mooring. It was on the surface before we had a confirmed ascent rate.

Approach took slightly longer than expected, possibly due to a less experienced driver. However the approach was calm and controlled, which is better than haphazard or rushed. During the approach, a sport-fishing vessel was sited off the starboard bow, heading towards the mooring in the water. The deck officers were finally able to raise it on the radio, and ask them to turn away. Recover from then on was smooth, though several instruments had problems. It appeared as though WB2 was subject to vibration or strumming. One RCM11 had broken bolts. Two microcats had lost their guards, and one microcat was flooded (the last not expected to be related to strumming).

We then triangulated WBH2 and found that it had not fallen back, but instead drifted south—likely with the deep currents—by 0.22 nm from the anchor drop position. The result was that WBH2 is now deployed in deeper water than intended, by about 60 m. We will attempt to allow for an unexpected anchor drift tomorrow, with WB2's deployment.

Thursday, 28th April 2011

We began with deploying WB2. We chose to deploy it upcurrent, downwind, with a 2 nm setup distance. This was assuming a current speed of 1 kt, 1.5 kts through water and 4 hours to work. However, the current was up to 1.5 kts for part of the time, meaning that after the first hour, we'd only made 0.3 nm over ground. Deployment began around 09:00, and ended around 14:00. Even so, the lander WB2L5 was recovered, and WB2L7 deployed before dinner. Triangulation showed that WB2 had only moved 0.17 nm from the anchor drop point, and so was well within the desired target area. In the evening, the microcats from WB2 were caldipped.

Friday, 29th April 2011

The day began with WB0 release after breakfast, and quickly finished around 09:00. WB1 was released just before 10:00, and after a quick approach and grapple, was all onboard by 11:40. It was decided to redeploy WB1 in the afternoon, rather than wait till the following day, and deployment started around 13:00. We had surface currents of nearly 2 kts, so after discussions with the bridge, it was decided to start slightly

upcurrent of the anchor dropsite (by about 0.2 nm) and by steaming upcurrent at 1.5 kts, end up sliding backwards to the drop site. This was quite effective, though relative to other drop positions, the stern of the ship was further along the track than when we are moving ahead over ground.

After surveying the anchor position of WB1, we recovered WBADCP. There was some debate about whether to recover tonight or tomorrow, due to a rainsquall that was about 5 nm off the recovery site. After watching the radar for a few minutes, it was determined that the squall was not moving, and there were 10 kts of wind holding it back. We released the mooring at 17:48, and soon after, lightening and thunder were seen in the squall. The squall moved forward and there was heavy rain on the ship by 18:06, as well as lightening that was a bit close for comfort. All instruments were onboard at 18:10, and people under cover a minute or two later. Pies telemetry continues tonight.

Saturday, 30th April 2011

After breakfast, the US team deployed their WB0, then surveyed until shortly after 11:00. We steamed to the site of WBADCP and deployed after lunch. The lander was deployed shortly after, and moorings work concluded by 14:00. The last caldip began around 16:00 with instruments from WB1. Following the caldip, an ADCP survey of the Antilles current was executed.

7 Mooring Operations

R. McLachan

7.1 Mooring Summary

Tables 7.1 and 7.2 summarise the mooring operations on KN200-4.

| Mooring name | NMFD mooring number | Deployment cruise | Deployment date/time | Recovery date/time |
|--------------|---------------------|-------------------|----------------------|--------------------|
| WB6_4 | 2010/01 | OC459-1 | 28/03/2010 15:45 | 20/04/2011 17:03 |
| WBH2_4 | 2010/04 | OC459-1 | 01/04/2010 13:42 | 26/04/2011 18:05 |
| WB2_8 | 2010/03 | OC459-1 | 31/03/2010 15:20 | 27/04/2011 16:30 |
| WB1_7 | 2010/08 | OC459-1 | 03/04/2010 13:18 | 29/04/2011 13:30 |
| WBADCP_7 | 2010/06 | OC459-1 | 02/04/2010 01:05 | 29/04/2011 21:30 |
| WB2L5_5 | 2009/10 | RB0901 | 30/04/2009 15:00 | 28/04/2011 17:30 |
| WB4L5_5 | 2009/11 | RB0901 | 26/04/2009 22:39 | 04/05/2011 12:00 |

Table 7.1 Summary of UK mooring recoveries on KN200-4.

| Mooring name | NMFD mooring number | Latitude N | Longitude E | Depth (m) | Deployment date/time |
|--------------|---------------------|------------|-------------|-----------|----------------------|
| Wb6_5 | 2011/17 | 26.4930 | 70.5255 | 5500 | 21/04/2011 01:56 |
| Wbh2_5 | 2011/16 | 26.4768 | 76.6220 | 4763 | 27/04/2011 14:36 |
| WB2_9 | 2011/14 | 26.5153 | 76.7428 | * | 28/04/2011 17:21 |
| WB1_8 | 2011/13 | 26.5032 | 76.8152 | 1375 | 29/04/2011 19:01 |
| WBADCP_8 | 2011/18 | 26.5250 | 76.8680 | 617 | 30/04/2011 16:32 |
| WB2L7_7 | 2011/19 | 26.5072 | 76.7425 | * | 28/04/2011 20:19 |
| WB4L7_7 | 2011/20 | 26.4840 | 75.8103 | + | 23/04/2011 21:56 |
| WBAL2_2 | 2011/21 | 26.5262 | 76.8759 | 501 | 30/04/2011 17:21 |

Table 7.2 Summary of UK mooring deployments on KN200-4. * echo sounder not on. + not recorded.

7.2 Diary of Events

13th April

Mobilisation complete, set sail at 09:00.

14th April

Wound on moorings WB4 and WBH2. Eight releases were got ready for dip cast. Four casts will be carried out for Seabird calibration, four releases on each of the last two, down to 4000 m and 3500 m respectively.

The four releases that went down to 4000 m all worked well, good communication. Four releases down to 3500 m all worked fine with good communication.

15th April

Wound on mooring WB2. Downloaded Seabird calibration data. Prepared instruments.

16th April

Wound on WB11. Got ready WB6 ropes. Assembled WB6 buoyancy packages. Doubled up all of the releases that have been tested.

17th April

Assembled Nortek frames.

Assembled buoyancy packages for WB4L7 and WHB2.

18th April

Started working on RCM11s, new DSUs checked, time updated and erased. Installed in to the RCM11s.

19th April

Installed batteries in to Nortek. Updated mooring diagrams.

20th April

Installed new batteries and tested all Novatech lights and Argos beacons.

Due to the weather it has been decided to cancel the last two CTD casts in order to get mooring recoveries underway, to this end we steamed to WB6 site and started communication with the releases, both releases responded well and serial number 361 was used to release the mooring, the ascent rate was calculated as 92 m/min.

Whilst this was on its way up we readied four more releases and 8 Seabirds 37s for cal/test dip. Two BPRs were also prepared for deployment. An Argos beacon; sn Z02-003, ID 53128 and light sn Z02-018 were also got ready for deployment on WB6.

WB6 was recovered without problems, though the two glass spheres at 5300 m had imploded.

The 4 releases and 8 Seabirds were then secured to the CTD frame and the CTD was subsequently deployed.

The releases all responded well to communication, once the echo sounder was turned off.

Six more releases were bench tested and all worked fine, ready for the next CTD deployment.

Two of the releases from the four that were last tested were used on WB6, serial numbers 498 and 324. The releases were assembled in to the tripod and the mooring was then deployed, there was hardly any light on deck, combined with the ship movement due to weather and the limited deck space, this operation was far from ideal. The deployment also took place at 20:45 in the evening.

21st April

All of the 6 releases communicated well, upon recovery all had fired. These were then assembled in to doublers ready for deployment.

Deck being prepared for Miami WB5 mooring recovery.

WB5 recovered with a few tangles to contend with but otherwise ok. WB5 Lander was then recovered without problem.

We then got a replacement Lander ready and deployed that.

22nd April

Deployment of Miami WB5 mooring.

23rd April

We started by readying the deck for the recovery of WB4, recovery was delayed whilst the ship manoeuvred. Recovery was completed without incident. Fish bite was noticed; see photos.

We then deployed WB4L7 and moved the recovered rugby floats up to the next deck.

24th April

Steve and Dave up at 05:30 to fire the release of WB4L5, the rest of us up at 06:15, the Lander was then recovered. We then got things ready for the WB4 deployment, this took quite a while as we had to build the rugby floats and these are difficult to assemble. We are now towing the mooring to the deployment site. Mooring anchor released and the mooring was watched to the sea bed, 190 m/min decent rate.

We then triangulated both WB4 and WB4L7 at the same time as both are near each other. We did this by entering the arm code of both releases at the same time, one into the arm command box and one into the command box, this worked well.

25th April

Tom and Colin up at 06:30 for winch driving for the Miami moorings although the mooring was not released until 07:20. WB3 was then recovered followed by the Lander recovery then a replacement Lander was deployed.

All of the Seabird 37s for WBH2 and WB2 had a complete service, see spreadsheet for details. The Seabird spares boxes were then replenished. Updated mooring diagrams.

26th April

Started deployment of WB3 at 08:00. Arranged labs ready for WBH2 and WB2 recovery. Set up Norteks for WBH2 and WB2.

WB3 deployed, releases watched to bottom, we then steamed to WBH2 site and started communication with the releases, both releases responded well and gave good ranges, serial number 911 was used to release and an ascent rate of 80 m/min was recorded. The recovery line was tangled with the 1500 m current meter; a couple more small tangles presented themselves both nothing major.

We then started to break down the recovered glass and re-assemble into buoyancy packages for WB2. We also removed the recovered ropes from the winch and put the drum with WBH2 to deploy in its place.

27th April

Finished preparation for WBH2 deployment, deployment then commenced and all went well, the releases were watched to the bottom.

We then prepared for WB2 recovery. At first we had difficulty establishing communication but the Superducer was trailing fwd. Once this was sorted out the releases both worked fine. The mooring was then recovered with a few tangles to deal with.

We then dismantled the recovered glass and then finished off assembling the glass for WB2 to deploy. We then triangulated WBH2 that was deployed earlier.

28th April

WB2 lower buoy Argos and light will use the recovered ones from the same mooring. Argos for the upper buoy y01-030 46503, light x01-052.

Started at 07:00. Got everything ready for the WB2 deployment, deployment went well, though we had to tow for a while before dropping the anchor. We then watched the releases to the bottom.

We then set up for the recovery of WB2L5, the releases responded well and the mooring was released, recovery commenced.

We then prepared for WB2L7 deployment, this went well. We then steamed to the first triangulation point for both WB2 and WB2L. Triangulation of both moorings was then undertaken.

After this we assembled all of the buoyancy ready for the WB1 deployment.

The CTD frame was then loaded with seabirds ready for the calibration dip.

WB1 to deploy will use Argos sn z02-007 id 53156 and light sn x01-049 on the small buoy.

29th April

Started with the recovery of WB0, this went well. We then repositioned and started the recovery of WB1, this also went well.

We decided to do a quick turn around and redeploy WB1, so we did this and all went well, so well that we had time to recover the ADCP west mooring. There was some confusion on the bridge and we ended up steaming off while the chain and release was still in the water, all was recovered in the end with no harm done.

30th April

The day started with the deployment of WB0, this went well. We then repositioned while we got the ADCP west ready for deployment. This was subsequently deployed without incident.

We then repositioned ready for the WBAL2 deployment whilst getting it ready. The Lander was then deployed without incident.

There will be one final Seabird calibration dip.

End of mooring operation.

8 Instruments

8.1 Summary of Instruments Recovered and Deployed

Table 8.1 gives a summary of the instruments recovered and deployed on cruise KN200-4. Appendix B gives more detailed information on which instruments were recovered from each mooring along with a summary of the length of record obtained. Complete setup details of deployed instruments can be found in Appendix C.

| Instrument type | Manufacturer and model | Total intended for recovery | Total recovered | Total lost | Total deployed |
|----------------------------|---------------------------------------|-----------------------------|-----------------|------------|----------------|
| CTD | Seabird SBE37 SMP MicroCAT | 54 | 54 (2 flooded) | 0 | 49 |
| | Seabird SBE37 IMP MicroCAT | 0 | 0 | 0 | 5 |
| Single Point Current Meter | Sontek Argonaut MD | 2 | 2 | 0 | 0 |
| | Aanderaa RCM11 | 10 | 10 | 0 | 5 |
| | Nortek Aquadopp | 15 | 15 | 0 | 22 |
| Current Profiler | RD Instruments 75 kHz Longranger ADCP | 1 | 1 | 0 | 1 |
| BPR | Seabird SBE53 BPR | 5 | 5 | 0 | 8 |

Table 8.1 Summary of instruments recovered and deployed

8.2 Instrument Problems

D. Rayner

Seabird MicroCATs

Sn:3229 had a slow conductivity response on the caldip, most likely caused by a faulty pump. This was exactly as seen on OC459 and this instrument had been back to Seabird but obviously wasn't fixed. I think this is because Seabird were not told of the specific problem so performed a standard calibration and service (the Seabird calibrations switch the pump off so the fault was not noticed).

Sn:5246 was under reading pressure by approximately 100 dbar on the pre-deployment caldip so was not deployed. Sn:6819 was over-reading the pressure on the post-deployment caldip. This was as expected as it was seen to over-read on the pre-deployment caldip aboard cruise RB1009, but the fault was not noticed until after the instrument had been deployed.

Sn:6112 needs a new bulkhead connector. The thread is broken due to a likely impact with the guide clamp, which we suspect came off when the mooring was subject to strumming.

Sn:3906 flooded on WB2 at approximately 500 m. This instrument has had a Kistler pressure sensor fitted and went on a pre-deployment caldip on the Oceanus. Strumming

had caused the guide clamp to shake loose and the pins were bent - probably from the impact of the guide, but the cause of flood is unknown.

Sn:3930 flooded on WB1 at approximately 500 m. It was recovered with the end cap blown off but the reason for the flooding is unknown. It too has recently been changed to a Kistler pressure sensor.

Sn:3231 had a bad T response on the post-deployment caldip and needs to be recalibrated. Sn:6118 has a poor conductivity response on the post-deployment caldip and therefore a suspect pump.

Nortek Aquadopps

Sn:5897 had the pressure sensor under-reading on WB4. This was excepted as it was not zeroed before deployment on RB1009 despite being noticed to be under-reading previously. There were however four other Norteks that were not zeroed prior to deployment and therefore are also under-reading pressure. The pressure sensor under-reads by a fixed amount and so offsets of 1575 dbar, 1170 dbar, 1135 dbar and 1090 dbar need to be applied to correct the data for instruments with serial numbers 5897 (from WB4), 6743, 6751 and 6753 (all three from WBH2) respectively. Sn:5963 cannot be corrected as it was deployed at approximately 100 m depth and the offset was evidently greater than this as the record does not deviate from zero for the duration of the deployment. The setup procedures will be modified to ensure that the pressure sensor is zeroed when the instrument is readied for deployment.

Nortek 5963 has a broken pin in the connector. The cap was fouled with a hard calcareous growth which when twisting off the end cap sleeve caused the pin to break. It was downloaded with an end cap from another instrument instead, but this needs fixing.

Sontek Argonaut MDs

There were problems when downloading the Sontek from WB2 (sn D295). At first the instrument would not connect at any baud rate. It eventually connected at 600 baud and I sent the command "userdefaultbaudrate set 115200". The instrument replied with an "ok" acknowledgement so I changed the software to 115200 to match. The instrument would not connect at this higher baud rate. After much playing around (including using an external power supply instead of the battery) I eventually found that it could hear commands but not reply properly so I reduced the baud rate till communications were reliable. The highest baud rate that could get it to talk "cleanly" was at 2400 but this was still causing problems. If using the recorder button in SonTerm (part of Sonutils) then it would say there was a problem with the recorder and to check that it was installed correctly. This didn't work at any baud. However when trying the ViewArgonaut recorder function at 2400 the recorder showed two files. The main deployment file (WB2001) being 882424 bytes and a second file (WB2002) being 1330 bytes. These files were then at 2400 . The download took place on Paul's old laptop using SontekRecorder v2.61.

Aanderaa RCM11s

Sn:450 frequently didn't record the 8th channel (and sometimes the 7th channel too). The records therefore ended up joined together and had to be manually split during the download process and the missing channel data filled with "0000". This may cause spikes in the signal strength record.

9 Mooring Instrument Processing

9.1 SBE 37 MicroCAT Processing

E. Frajka-Williams

The standard processing scripts were used for this cruise, based on those used for D359. Raw data and capture files for calibration casts (caldips) are located on hydrosea5 mac mini, in directory `raw/kn200-4/microcat_cal_dip/` (relative to `/Users/hydrosea5/kn200-4/rpdmoc/rapid/data/moor/`) and for moorings, in directory `raw/kn200-4/microcat/`. Stage 1 caldip data is in `proc_calib/kn200_4/cal_dip/microcat/cast[cast number]/` along with the `info.dat` file. Stage 1 and later processing stages for moorings are located in `proc_kn200_4/[mooring name]/`.

Stage 0 – Download

The MicroCAT data were downloaded with Seabird SBE Seaterm software (for SMPs with firmware < 3.0d), with Seabird SBE SeatermV2 software (for SMPs with firmware ≥ 3.0d) and with Darren's IMPDownload routine (for IMPs). For instruments recovered from moorings, the standard filenames were `XXXX_data.asc` (or `.cnv` and `.xml` for the version 3.0 firmware microcats) and `XXXX_recover.cap` where XXXX is the serial number. For instruments recovered from caldips, it was `XXXX_cal_dip_data.asc` and `caldip_XXXX.cap` for calibration dip files.

Stage 1 – Conversion from .asc to the RDB format .raw

The file used for processing mooring data was `mc_call_2_kn200.m` (copied from `mc_call_2_d359.m`), and that for processing calibration dips was `mc_call_caldip_kn200.m` (copied from `mc_call_caldip_d359.m`). For calibration dips, a function called `parse_cnv.m` was created to process the SBE911 CTD data in `.cnv` format to `.mat` format with appropriate filenames, and CTD data were located in `/Users/hydrosea5/kn200-4/ctd/`. This function is located in directory `exec/kn200_4/calibration/`.

Stage 2 – Trimming of Data Record

The script used was `microcat_raw2use_003.m` with no cruise name appended. The script is modified with the addition of mooring names, data directories, and plot interval, but the start and end dates used are read in from the `info.dat` files.

CTD Calibration Casts

To estimate any trend in conductivity, temperature and pressure reported by the SBE37 MicroCATs during their year-long deployment (for example due to biofouling or sensor drift), each instrument is lowered on the CTD package to provide pre or post deployment

calibrations. Up to 24 SBE37 CTDs are clamped to straps on the CTD frame and secured by plastic cable ties. The sampling rate is set to a period of 10 s, which is the fastest available. For pre deployment instruments the sample number is set to zero, for post deployment instruments the sample number is one more than the last sample number from the year-long deployment. The lowered CTD is a Seabird 9/11 with recently calibrated CTP sensors with the C being adjusted to absolute values of conductivity by reference to seawater samples drawn and analysed against standard sea water.

The CTD is lowered to a minimum depth of 3500 m into where the ocean temperature and salinity distribution is stable. The maximum depth of the cast is then chosen to be the depth at which the deepest MicroCAT was deployed on a mooring. This maximum depth requirement is important for providing accurate pressure calibrations, but is not critical for temperature or conductivity. During the upcast the CTD is stopped for five minute bottle stops at several depths, providing stable comparisons between CTD and MicroCATs. CTD bottle samples are also obtained at these depths. On this cruise there were 12 Niskin bottles, so 12 five minute comparisons between CTD and MicroCAT are available.

On recovery, MicroCATs are downloaded in the usual way. Microcat data are then processed together using `mc_call_caldip_kn200.m`. This now reads a CTD 1 hz file in `.cnv` format which was provided by the NOAA group, Rigoberto. Particularly for pre-deployment instruments, comparisons between the CTD and MicroCATs at bottle stops are inspected for anomalies in the MicroCAT records. Examples are lagged conductivities due to pump problems or bad pressures. These instruments are withheld from deployment. More serious calibration work to adjust mooring MicroCAT data is a post cruise activity

9.2 Current Meter Processing

D. Rayner

Current meter data were simply processed with the available scripts. Stage 0 is downloading the data from the instruments, converting it to a Matlab-readable format, and transferring it to the computer system. Files for Anderaa RCM11 current meters are found in `rcm/` or `rcm11/` directories; those for Nortek Aquadopp current meters are found in `nor/` or `nortek/`; those for Sontek Argonaut current meters are found in `argonaut/` or `arg/` or `argocat/`. The files used are listed below for each stage with any noteworthy comments.

| | |
|---------------|---|
| RCM11 | |
| Stage 1 | <code>rcm2rodb_05.m</code> This script requires a version of Matlab with the “brush” function to correct conductivity wrapping. |
| Stage 2 | <code>rcm11raw2use.m</code> |
| Nortek | |
| Stage 1 | <code>nortek2rodb_01.m</code> |
| Stage 2 | <code>nortek_raw2use_01.m</code> |
| Sontek | |
| Stage 1 | <code>argocat2rodb_004.m</code> . Has been updated to fix a bug where the data format changed slightly for files produced in ViewArgonaut version 3.71. New format has 2 fewer columns in it (CellBegin and CellEnd are missing). |
| Stage 2 | <code>argocat_raw2use_003.m</code> |

The Longranger ADCP data were downloaded from the instrument into a binary format using RDI software. The data are then passed on to our American colleagues for post processing.

9.3 Seabird SBE26 or SBE53 BPR Processing

E. Frajka-Williams

The standard processing scripts were used for this cruise, based on those used for D359. Raw data and capture files are located on hydrosea5 in directory `raw/kn200-4/seagauge/` (relative to `/Users/hydrosea5/kn200-4/rpdmoc/rapid/data/moor/`) while later processing stages are located in `proc/[mooring_name]/`.

Stage 0

Data are downloaded with Seabird SBE Seaterm and transferred to the processing computer, and any comments are recorded in written logs.

Stage 1

This step is performed with `seagauge2rdb_003.m`, which is essentially unmodified from previous cruises. No clock offsets were needed, hence the file `raw/kn200-4/clock_offset.dat` does not exist. These offsets typically come from incorrect dates entered during initial setup or while downloading from the instrument, rather than clock drift (see stage 2).

Stage 2

The filename `seagauge_raw2use_kn200.m` was used, which was originally called `seagauge_processing_002.m` a few cruises ago. Clock offsets at the end for the cast are treated as linear drifts and are recorded in `raw/kn200-4/seagauge/bpr_clock_offset.dat`.

Appendix A – Details of Instruments Lowered on CTD Calibration Casts

Pressure offsets greater than 15 dbar during a calibration cast are noted. Timing off indicates that the microcat clock does not match the CTD clock.

| Cruise Cast Number | Team | s/n | Notes |
|--------------------|------|-----------------------|------------|
| 6 | US | 3164 | |
| | US | 3166 | |
| | US | 3168 | |
| | US | 3861 | |
| | US | 3865 | |
| | US | 4624 | |
| | US | 5871 | |
| | US | 5872 | |
| | US | 5873 | |
| | US | 5874 | |
| | US | 5875 | |
| | US | 3868 | Timing off |
| | UK | 3483 | |
| | UK | 3486 | |
| | UK | 4714 | Timing off |
| | UK | 3248 | |
| | UK | 3249 | |
| | UK | 3251 | |
| | UK | 3252 | |
| | UK | 3253 | |
| UK | 3257 | | |
| UK | 3216 | Large pressure offset | |
| 7 | US | 3150 | |
| | US | 3154 | |
| | US | 3155 | |
| | US | 3162 | |
| | US | 3866 | |
| | US | 3867 | |
| | US | 3869 | |
| | US | 3870 | |
| | US | 3871 | |
| | US | 3872 | |
| | US | 4619 | |
| | US | 4621 | |
| | US | 5878 | |
| | US | 5881 | |
| | UK | 3259 | |
| | UK | 3264 | |
| | UK | 3268 | |
| | UK | 3220 | |

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| | | | |
|----|----|------|----------------------------------|
| | UK | 3900 | |
| | UK | 3901 | |
| | UK | 3903 | |
| | UK | 4066 | |
| 8 | UK | 5242 | Large pressure offset |
| | UK | 5765 | Large pressure offset |
| | UK | 6839 | Large pressure offset |
| | UK | 3229 | Slow conductivity response |
| | UK | 3284 | |
| | UK | 3484 | |
| | UK | 5788 | |
| | UK | 3904 | |
| | UK | 3910 | Timing off |
| | UK | 4461 | |
| | UK | 3916 | |
| | UK | 4464 | Timing off |
| | UK | 6823 | |
| | 9 | UK | 7681 |
| UK | | 6841 | |
| UK | | 6838 | |
| UK | | 6837 | |
| UK | | 6834 | |
| UK | | 6833 | |
| UK | | 6832 | |
| UK | | 6831 | Large pressure offset |
| UK | | 6829 | |
| UK | | 6817 | |
| UK | | 6818 | |
| 36 | | UK | 3247 |
| | UK | 5246 | Large pressure offset - 110 dbar |
| | UK | 6820 | |
| | UK | 6821 | |
| | UK | 6822 | |
| | UK | 3209 | |
| | UK | 6816 | Large pressure offset |
| | UK | 6840 | |
| 37 | UK | 3207 | Large pressure offset |
| | UK | 5238 | |
| | UK | 3212 | |
| | UK | 3213 | Large pressure offset |
| | UK | 3214 | |
| 39 | UK | 3206 | |
| | UK | 3215 | |
| | UK | 6819 | Large pressure offset - 230 dbar |
| | UK | 3219 | |
| | UK | 3221 | |
| | UK | 6798 | |
| | UK | 6799 | Slow conductivity response |
| | UK | 6800 | |
| | UK | 6801 | |

| | | | |
|--|----|------|--|
| | UK | 6802 | |
| | UK | 3222 | |
| | UK | 3234 | |
| | UK | 3224 | |
| | UK | 3913 | |
| | UK | 3225 | |

Table A.1 *Details of instruments lowered on CTD calibration casts.*

Appendix B – Instrument Record Lengths

| Mooring name | Type | s/n | Approx depth | Date of first useable record [YYYY MM DD HH] | Date of last useable record [YYYY MM DD HH] |
|--------------|--------|-------------------|---------------------|--|---|
| WB6 | SBE | 3207 | 5100 | 2010 03 28 17.00028 | 2011 04 20 17.00028 |
| | SBE | 5238 | 5200 | 2010 03 28 17.00028 | 2011 04 20 17.00056 |
| | SBE | 3212 | 5300 | 2010 03 28 17.0028 | 2011 04 20 17.00056 |
| | Sontek | D273 | 5400 | 2010 03 28 17:00:00 | 2011 04 20 16:30:00 |
| | SBE | 3213 | 5400 | 2010 03 28 17.00028 | 2011 04 20 17.00028 |
| | SBE | 3214 | 5495 | 2010 03 28 17.00028 | 2011 04 20 17.00056 |
| | BPR | 418 | 5500 | 2010 03 28 17.00000 | 2011 04 20 16.50000 |
| | BPR | 32 | 5500 | 2010 03 28 17.00000 | 2011 04 20 16.50000 |
| WB4 | SBE | 3206 | 50 | 2010 12 01 0.50028 | 2011 04 23 15.00028 |
| | Nortek | 5879 | 100 | 2010 11 30 23.50000 | 2011 04 23 15.00000 |
| | SBE | 3215 | 100 | 2010 12 01 0.50028 | 2011 04 23 15.00028 |
| | SBE | 6819 | 250 | 2010 12 01 1.00028 | 2011 04 23 15.00028 |
| | Nortek | 5884 | 400 | 2010 11 30 23.50000 | 2011 04 23 15.00000 |
| | SBE | 3219 | 400 | 2010 12 01 0.50028 | 2011 04 23 15.00028 |
| | SBE | 3221 | 600 | 2010 12 01 0.50028 | 2011 04 23 15.00028 |
| | Nortek | 5889 | 800 | 2010 11 30 23.50000 | 2011 04 23 15.00000 |
| | SBE | 3222 | 800 | 2010 12 01 0.50000 | 2011 04 23 15.00000 |
| | SBE | 3224 | 1000 | 2010 12 01 0.50028 | 2011 04 23 15.00000 |
| | Nortek | 5890 | 1200 | 2010 11 30 23.50000 | 2011 04 23 15.00000 |
| | SBE | 3225 | 1200 | 2010 12 01 0.50056 | 2011 04 23 15.00056 |
| | Nortek | 6132 | 1600 | 2010 11 30 23.50000 | 2011 04 23 15.00000 |
| | SBE | 3234 | 1600 | 2010 12 01 0.50028 | 2011 04 23 15.00028 |
| | Nortek | 5897 ^s | 2000 | 2010 11 30 23.50000 | 2011 04 23 15.00000 |
| | SBE | 3913 | 2000 | 2010 12 01 0.50028 | 2011 04 23 15.00028 |
| | SBE | 6798 | 2500 | 2010 12 01 0.50028 | 2011 04 23 15.00028 |
| | Nortek | 5967 | 3000 | 2010 11 30 23.50000 | 2011 04 23 15.00000 |
| | SBE | 6799 | 3000 | 2010 12 01 0.50028 | 2011 04 23 15.00028 |
| | SBE | 6800 | 3500 | 2010 12 01 0.50028 | 2011 04 23 15.00028 |
| | Nortek | 6119 | 4000 | 2010 11 30 23.50000 | 2011 04 23 15.00000 |
| SBE | 6801 | 4000 | 2010 11 30 23.50028 | 2011 04 23 15.00028 | |
| SBE | 6802 | 4500 | 2010 11 11 23.50028 | 2011 04 23 15.00028 | |
| Nortek | 6765 | 4629 | 2010 11 30 23.50000 | 2011 04 23 15.00000 | |
| WB4L | BPR | 33 | 4715 | 2009 04 26 23.50000 | 2011 04 24 9.50000 |
| WBH2 | Nortek | 6176 | 1500 | 2010 04 01 17.00000 | 2011 04 26 18.00000 |
| | Nortek | 6743 [%] | 2200 | 2010 04 01 17.00000 | 2011 04 26 18.00000 |
| | Nortek | 6747 | 3000 | 2010 04 01 17.00000 | 2011 04 26 18.00000 |
| | Nortek | 6751 [£] | 3800 | 2010 04 01 17.00000 | 2011 04 26 18.00000 |
| | SBE | 3258 | 3800 | 2010 04 01 17.00028 | 2011 04 26 18.00028 |
| | SBE | 5245 | 4300 | 2010 04 01 17.00028 | 2011 04 26 18.00000 |
| | Nortek | 6753 [@] | 4700 | 2010 04 01 17.00000 | 2011 04 26 18.00000 |
| WB2 | SBE | 3905 | 4780 | 2010 04 01 17.00028 | 2011 04 26 18.00028 |
| | SBE | 3223 | 50 | 2010 03 31 21:30:01 | 2011 04 27 16:30:01 |
| | RCM11 | 305 | 100 | 2010 03 31 21.50000 | 2011 04 27 16.36667 |

Rapid Mooring Cruise Report for KN200-4 – April – May 2011

| | | | | | |
|--------|-------------|-------|---------------------|----------------------------------|---------------------|
| | SBE | 5239 | 100 | 2010 03 31 21:30:01 | 2011 04 27 16:30:02 |
| | RCM11 | 306 | 175 | 2010 03 31 21.50000 | 2011 04 27 16.46667 |
| | SBE | 3228 | 175 | 2010 03 31 21:30:00 | 2011 04 27 16:30:00 |
| | SBE | 5243 | 325 | 2010 03 31 21:30:01 | 2011 04 27 16:30:02 |
| | RCM11 | 445 | 400 | 2010 03 31 21.50000 | 2011 04 27 16.35000 |
| | SBE | 3906 | 500 | Bent end cap - flooded | |
| | SBE | 5244 | 700 | 2010 03 31 21:30:01 | 2011 04 27 16:30:02 |
| | RCM11 | 448 | 800 | 2010 03 31 21.50000 | 2011 04 27 16.41667 |
| | SBE | 3230 | 900 | 2010 03 31 21:30:01 | 2011 04 27 16:30:01 |
| | SBE | 6113 | 1100 | 2010 03 31 21:30:01 | 2011 04 27 16:30:01 |
| | RCM11 | 449 | 1200 | 2010 03 31 21.50000 | 2011 04 27 16.45000 |
| | SBE | 3231 | 1300 | 2010 03 31 21:30:01 | 2011 04 27 16:30:02 |
| | SBE | 6114 | 1500 | 2010 03 31 21:30:01 | 2011 04 27 16:30:01 |
| | Sontek | D295 | 1500 | 2010 03 31 21:30:00 | 2011 04 27 16:30:00 |
| | SBE | 3232 | 1700 | 2010 03 31 21:30:01 | 2011 04 27 16:30:00 |
| | SBE | 5247 | 1900 | 2010 03 31 21:30:02 | 2011 04 27 16:30:03 |
| | RCM11 | 450 | 2050 | 2010 03 31 21.50000 | 2011 04 27 16.40000 |
| | SBE | 3233 | 2300 | 2010 03 31 21.50028 | 2011 04 27 16.50056 |
| | SBE | 6112 | 2800 | 2010 03 31 21.50028 | 2011 04 27 16.50028 |
| | RCM11 | 451 | 3000 | 2010 03 31 21.50000 | 2011 04 27 16.48333 |
| | SBE | 3244 | 3300 | 2010 03 31 21:30:01 | 2011 04 27 16:30:02 |
| | SBE | 3907 | 3850 | 2010 03 31 21:30:01 | 2011 04 27 16:30:01 |
| WB2L | BPR | 34 | 3890 | 2009 04 30 15:00:00 | 2011 04 28 17:30:00 |
| | BPR | 36 | 3890 | 2009 04 30 15:00:00 | 2011 04 28 17:30:00 |
| WB1 | SBE | 5764 | 50 | 2010 04 03 17:30:02 | 2011 04 29 13:30:02 |
| | Nortek | 5963* | 100 | 2010 04 03 17.50000 | 2011 04 29 14.00000 |
| | SBE | 6115 | 100 | 2010 04 03 17:30:01 | 2011 04 29 13:30:01 |
| | SBE | 3919 | 175 | 2010 04 03 17:30:01 | 2011 04 29 14:00:02 |
| | SBE | 6116 | 250 | 2010 04 03 17:30:01 | 2011 04 29 13:30:01 |
| | SBE | 3928 | 325 | 2010 04 03 17:30:01 | 2011 04 29 13:30:02 |
| | RCM11 | 301 | 400 | 2010 04 03 17.50000 | 2011 04 29 13.93333 |
| | SBE | 6117 | 400 | 2010 04 03 17:30:01 | 2011 04 29 13:30:01 |
| | SBE | 3930 | 500 | Missing end cap - flooded | |
| | SBE | 6118 | 600 | 2010 04 03 17:30:01 | 2011 04 29 13:30:01 |
| | SBE | 3931 | 700 | 2010 04 03 17:30:01 | 2011 04 29 13:30:02 |
| | RCM11 | 302 | 800 | 2010 04 03 17.50000 | 2011 04 29 13.95000 |
| | SBE | 6119 | 800 | 2010 04 03 17.50028 | 2011 04 29 14.00028 |
| | SBE | 3932 | 900 | 2010 04 03 17.50028 | 2011 04 29 14.00028 |
| | SBE | 6120 | 1000 | 2010 04 03 17.00028 | 2011 04 29 13.50028 |
| | SBE | 6324 | 1100 | 2010 04 03 17.00028 | 2011 04 29 13.50028 |
| | RCM11 | 303 | 1200 | 2010 04 03 17.50000 | 2011 04 29 13.98333 |
| SBE | 6321 | 1200 | 2010 04 03 17:30:01 | 2011 04 29 13:30:01 | |
| SBE | 7723 | 1350 | 2010 04 03 17:30:01 | 2011 04 29 13:30:01 | |
| WBADCP | 75 kHz ADCP | 10311 | 600 | 2010 04 02 23.50000 | 2011 04 29 21.50000 |

Table B.1 Record of the instrument record lengths recovered during KN200-4. 4 (* indicates no valid pressure data. \$ indicates pressure offset of approx 1575 dbar. % indicates pressure offset of approx 1170 dbar. £ indicated pressure offset of approx 1135 dbar. @ indicates pressure offset of approx 1090 dbar.)

Appendix C – Instrument Setup Details

WBADCP

RDI Longranger 75 kHz Workhorse ADCP s/n: **10311**
 System frequency: 76.8 kHz
 Beam angle: 20 degrees
 Water salinity: 35
 Depth of transducer: 600 m
 Heading alignment: 0
 Heading bias: 0
 Depth cell size: 1600 cm
 Number of depth cells: 40
 Blank after transmit: 0704
 Pings per ensemble: 00010
 Ambiguity velocity: 175 cm/s radial
 Time per ensemble: 00:30:00
 Start date: 30/4/11 15:00

WBAL2

SBE53 BPR s/n, Start time: **0039**, 30/4/11 14:00
0417, 30/4/11 14:00
 Header: wbal2_deployed2011_kn200-4
 Tide interval: 30 min
 Tide measurements duration: 30 min
 Frequency of reference measurement: Every 96 samples
 Nominal depth: 500 m

WB1

SBE37 MicroCAT s/n (nominal depth), Start
 SMP CTD time: **3284** (50 m), 29/4/11 17:00
3264 (105 m), 29/4/11 17:00
3257 (175 m), 29/4/11 17:00
7681 (255 m), 29/4/11 17:00
6841 (325 m), 29/4/11 17:00
6816 (405 m), 29/4/11 17:00
6838 (500 m), 29/4/11 18:00
6837 (600 m), 29/4/11 18:00
6834 (700 m), 29/4/11 17:00
6833 (805 m), 29/4/11 17:00
6832 (900 m), 29/4/11 17:00
6831 (1000 m), 29/4/11 17:00
6829 (1100 m), 29/4/11 17:00
6817 (1205 m), 29/4/11 17:00
6818 (1350 m), 29/4/11 17:00

Rapid Mooring Cruise Report for KN200-4 – April – May 2011

| | | |
|-----------------------|-------------------------------------|---|
| | Sample interval: | 1800 s |
| Nortek Aquadopp CM | s/n (nominal depth), Start time: | 5831 (100 m), 26/4/11 22:30 5896 (400 m), 26/4/11 22:30 6765 (800 m), 29/4/11 14:00 5899 (1200 m), 26/4/11 22:30 |
| | Deployment name: | 5896=wb1_a 5899=wb1_b 5831=wb1_c 6765=wb1_d |
| | Sampling interval: | 1800 s |
| | Averaging interval: | 30 s |
| | Blanking distance: | 1.5 m |
| | Compass update rate: | 10 s |
| | Speed of sound: | Fixed |
| | Salinity: | 35.0 |
| | Diagnostic interval: | 720 min |
| | No. diagnostic samples: | 20 |

WB2

| | | |
|---------------------------|-------------------------------------|---|
| SBE37 MicroCAT SMP CTD | s/n (nominal depth), Start time: | 3220 (50 m), 28/4/11 12:00 5242 (105 m), 28/4/11 12:00 5765 (180 m), 28/4/11 12:30 3903 (325 m), 28/4/11 12:00 3904 (500 m), 28/4/11 12:00 3910 (700 m), 28/4/11 12:00 3916 (1300 m), 28/4/11 12:00 3216 (1500 m), 28/4/11 12:30 6823 (1700 m), 28/4/11 12:00 3900 (1900 m), 28/4/11 12:00 3901 (2300 m), 28/4/11 12:00 6939 (2800 m), 28/4/11 12:00 6798 (3300 m), 28/4/11 12:00 3247 (3850 m), 28/4/11 12:00 |
| SBE37 MicroCAT IMP CTD | s/n (nominal depth), Start time: | 4066 (900 m), 28/4/11 12:00 4461 (1100 m), 28/4/11 12:00 |
| SBE37 MicroCAT IM CTD | s/n (nominal depth), Start time: | 4619 (105 m), 28/4/11 12:00 (This is a RSMAS loan unit – without a pump) |
| | Sample interval for all CTDs: | 1800 s |
| Nortek Aquadopp CM | s/n (nominal depth), Start time: | 9204 (100 m), 26/4/11 22:30 9210 (175 m), 26/4/11 23:00 9213 (400 m), 26/4/11 23:00 5893 (1500 m), 26/4/11 23:00 |
| | Deployment name: | 9204=wb2_a 9210=wb2_b |

| | | |
|---------------------------|---|---|
| | | 9213=wb2_c |
| | | 5893=wb2_d |
| | Sampling interval: | 1800 s |
| | Averaging interval: | 30 s |
| | Blanking distance: | 1.5 m |
| | Compass update rate: | 10 s |
| | Speed of sound: | Fixed |
| | Salinity: | 35.0 |
| | Diagnostic interval: | 720 min |
| | No. diagnostic samples: | 20 |
| Aanderaa RCM11 CM | s/n (nominal depth), Start time: | 428 (800 m), 28/4/11 12:00 518 (1200 m), 28/4/11 12:00 519 (2050 m), 28/4/11 12:00 520 (3000 m), 28/4/11 12:00 |
| | Recording interval: | 30 mins |
| | No. of channels: | 8 |
| | Mode: | Burst |
| | Temperature range: | 428 = unknown |
| | <i>NB: these were not recorded properly and will need to be checked when recovered</i> | 518 = unknown 519 = unknown 520 = unknown |
| | Conductivity range: | 428 = 36-40 mS/cm |
| | <i>NB. These have not been confirmed and may be incorrect – again check on recovery</i> | 518 = 32-35 mS/cm 519 = 32-34 mS/cm 520 = 32-34 mS/cm |
| <u>WB2L7</u> | | |
| SBE53 BPR | s/n, Start time: | 0055 , 27/4/11 13:00 0056 , 27/4/11 13:00 |
| | Header: | wb2l_deployed_kn200-4 |
| | Tide interval: | 30 min |
| | Tide measurements duration: | 30 min |
| | Frequency of reference measurement: | Every 96 samples |
| | Nominal depth: | 3890 |
| <u>WBH2</u> | | |
| SBE37 MicroCAT SMP CTD | s/n (nominal depth), Start time: | 3214 (3805 m), 27/4/11 12:30 3213 (4300 m), 27/4/11 12:30 3212 (4780 m), 27/4/11 12:30 |
| | Sample interval: | 1800 s |
| Nortek | s/n (nominal depth), Start | 6723 (1500 m), 26/4/11 22:30 |

Rapid Mooring Cruise Report for KN200-4 – April – May 2011

| | | |
|-------------|-------------------------|--|
| Aquadopp CM | time: | 6083 (2200 m), 26/4/11 22:30 6805 (3000 m), 26/4/11 22:30 8052 (3800 m), 26/4/11 22:30 8120 (4700 m), 26/4/11 22:30 |
| | Deployment name: | 6723=wbh2_a 6083=wbh2_b 6805=wbh2_c 8052=wbh2_d 8120=wbh2_e |
| | Sampling interval: | 1800 s |
| | Averaging interval: | 30 s |
| | Blanking distance: | 1.5 m |
| | Compass update rate: | 10 s |
| | Speed of sound: | Fixed |
| | Salinity: | 35.0 |
| | Diagnostic interval: | 720 min |
| | No. diagnostic samples: | 20 |

WB4

| | | |
|---------------------------|---|---|
| SBE37 MicroCAT SMP CTD | s/n (nominal depth), Start time: | 3483 (105 m), 24/4/11 12:00 3486 (250 m), 24/4/11 12:00 4714 (405 m), 24/4/11 12:00 3248 (600 m), 24/4/11 12:00 3249 (805 m), 24/4/11 12:00 3251 (1000 m), 24/4/11 12:00 3252 (1205 m), 24/4/11 12:00 3253 (1600 m), 24/4/11 12:00 5788 (2005 m), 24/4/11 12:00 3259 (2505 m), 24/4/11 12:00 3484 (3005 m), 24/4/11 12:00 3268 (3505 m), 24/4/11 12:00 5238 (4005 m), 24/4/11 12:00 3207 (4500 m), 24/4/11 12:00 |
| SBE37 MicroCAT IMP CTD | s/n (nominal depth), Start time Sample interval for all CTDs: | 4464 (50 m), 24/4/11 12:00 1800 s |
| Nortek Aquadopp CM | s/n (nominal depth), Start time: | 5490 (100 m), 24/4/11 13:30 5590 (400 m), 24/4/11 13:30 5611 (800 m), 24/4/11 13:00 5955 (1200 m), 24/4/11 13:30 6049 (1600 m), 24/4/11 13:30 6050 (2000 m), 24/4/11 13:30 6088 (3000 m), 24/4/11 13:30 6516 (4000 m), 24/4/11 13:30 6534 (4630 m), 24/4/11 13:30 |
| | Deployment name: | 5490=wb4_a |

5590=wb4_b
 5611=wb4_c
 5955=wb4_f
 6049=wb4_h
 6050=wb4_j
 6088=wb4_e
 6516=wb4_d
 6534=wb4_g
 Sampling interval: 1800 s
 Averaging interval: 30 s
 Blanking distance: 1.5 m
 Compass update rate: 10 s
 Speed of sound: Fixed
 Salinity: 35.0
 Diagnostic interval: 720 min
 No. diagnostic samples: 20

WB4L7

SBE53 BPR s/n, Start time: **0057**, 23/4/11 14:00
0014, 23/4/11 14:30
 Header: wb4l_deployed_2011
 Tide interval: 30 min
 Tide measurements duration: 30 min
 Frequency of reference measurement: Every 96 samples
 Nominal depth: 4745 m

WB6

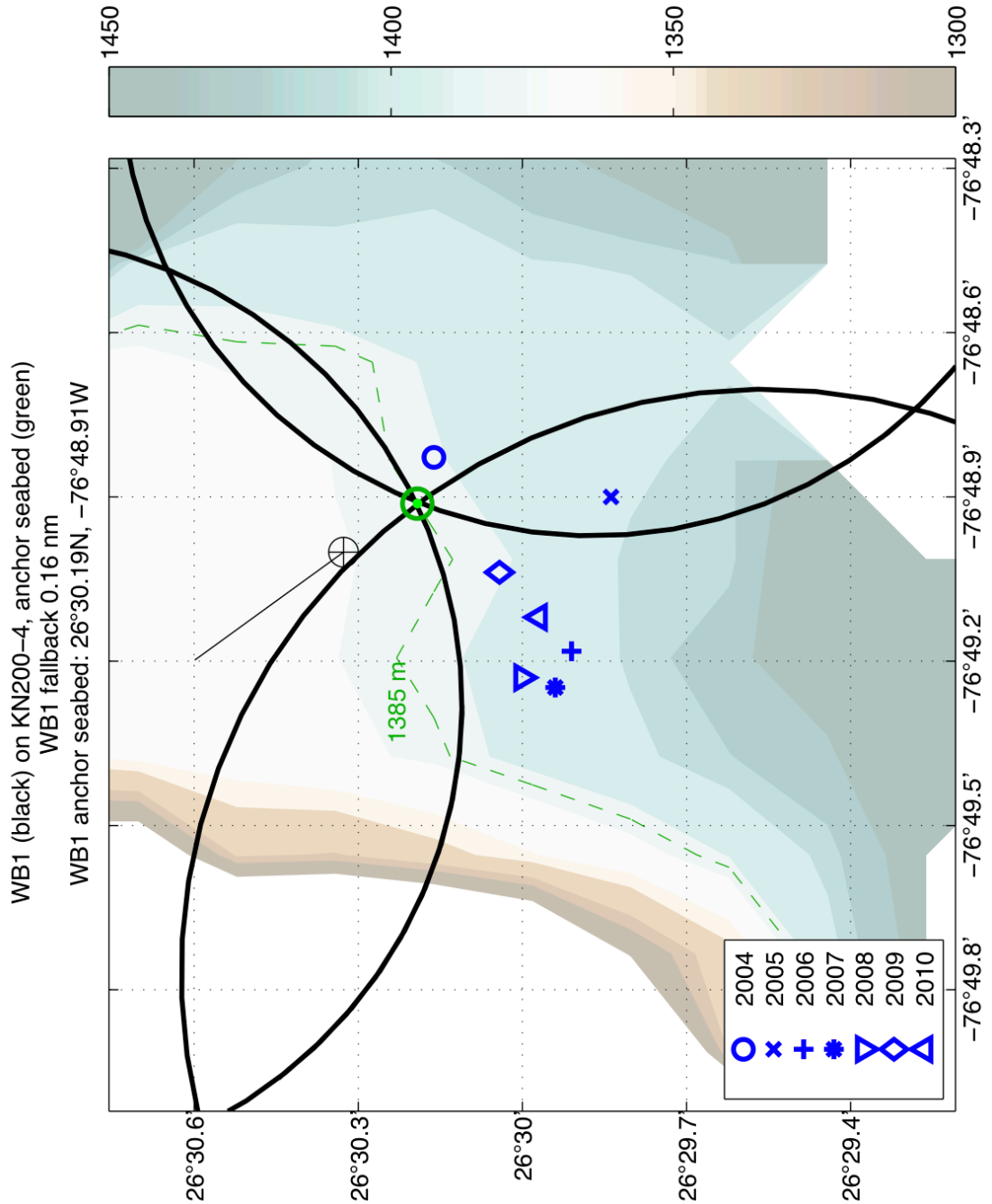
SBE37 MicroCAT s/n (nominal depth), Start time: **3209** (5100 m), 21/4/11 01:30
6840 (5200 m), 21/4/11 01:30
6820 (5300 m), 21/4/11 01:30
6821 (5400 m), 21/4/11 01:30
6822 (5491 m), 21/4/11 01:30
 SMP CTD
 Sample interval: 1800 s
 Start:

SBE53 BPR s/n, Start time: **0059**, 20/4/11 23:30
0053, 20/4/11 23:30
 Header: wb6_deployed_2011_kn200-4
 Tide interval: 30 min
 Tide measurements duration: 30 min
 Frequency of reference: Every 96 samples

| | | |
|----------------------|-------------------------------------|------------------------------------|
| | measurement: | |
| | Nominal depth: | 4745 m |
| Aanderaa RCM11 CM | s/n (nominal depth), Start time: | 515 (5400 m), 20/4/11 20:30 |
| | Recording interval: | 30 mins |
| | No. of channels: | 8 |
| | Mode: | Burst |
| | Temperature range: | Arctic |
| | Conductivity range: | 32-34 mS/cm |

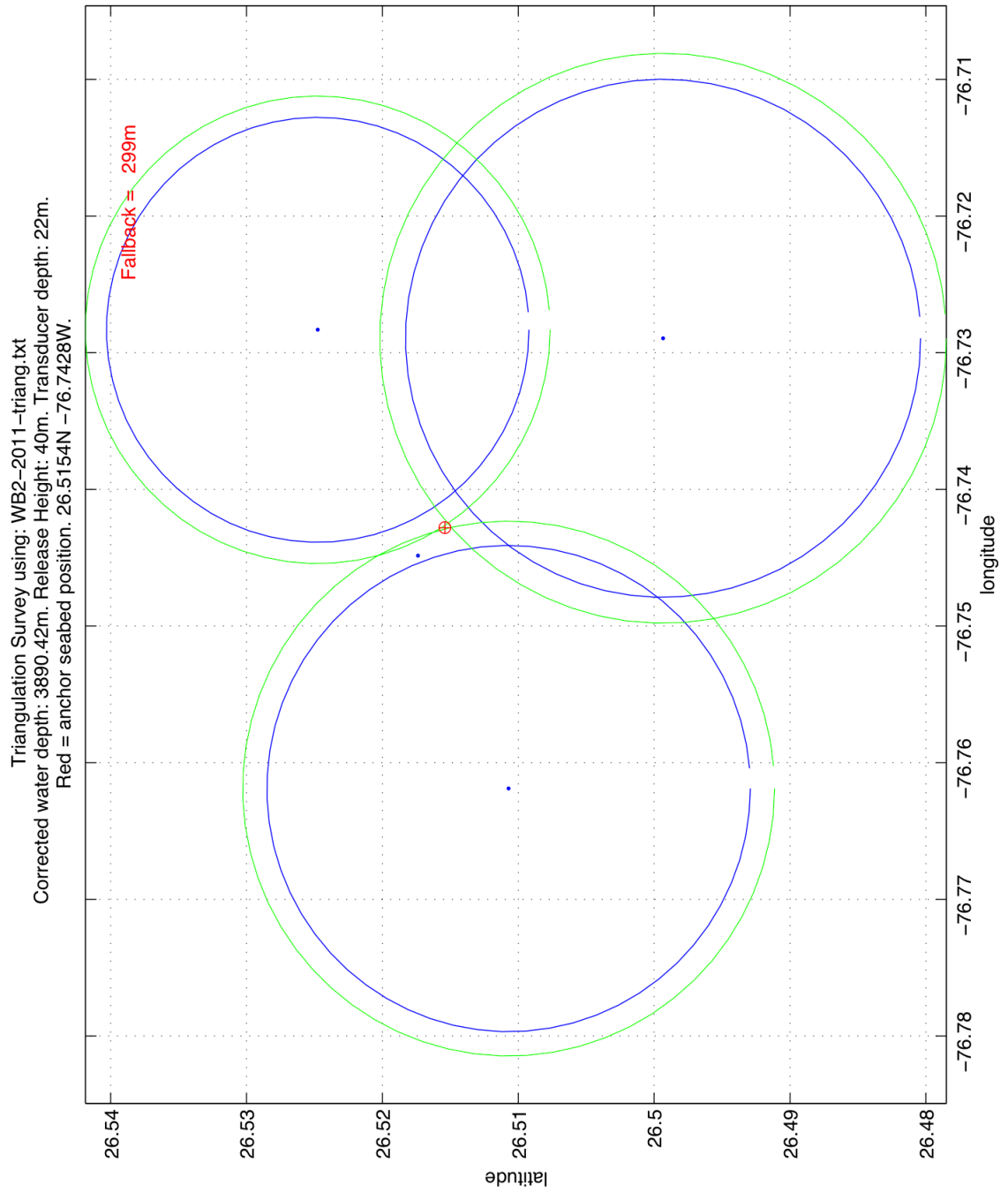
Appendix D – Deployment Tracks and Triangulation Surveys

WB1 triangulation, approach and final position

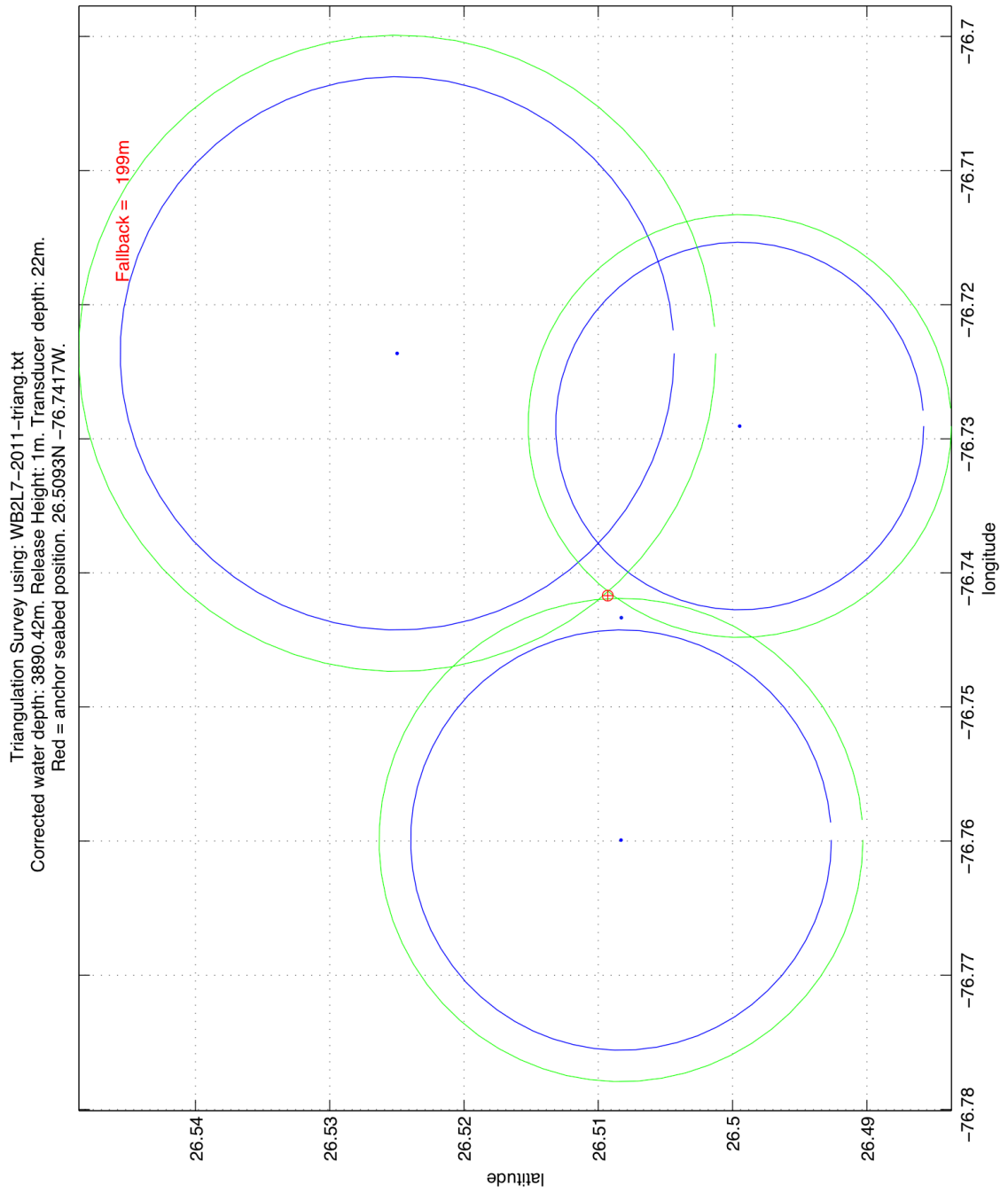


Note: WB1 was approached backwards, as in, the stern was leading along the short black line as the ship steamed slowly into a strong current.

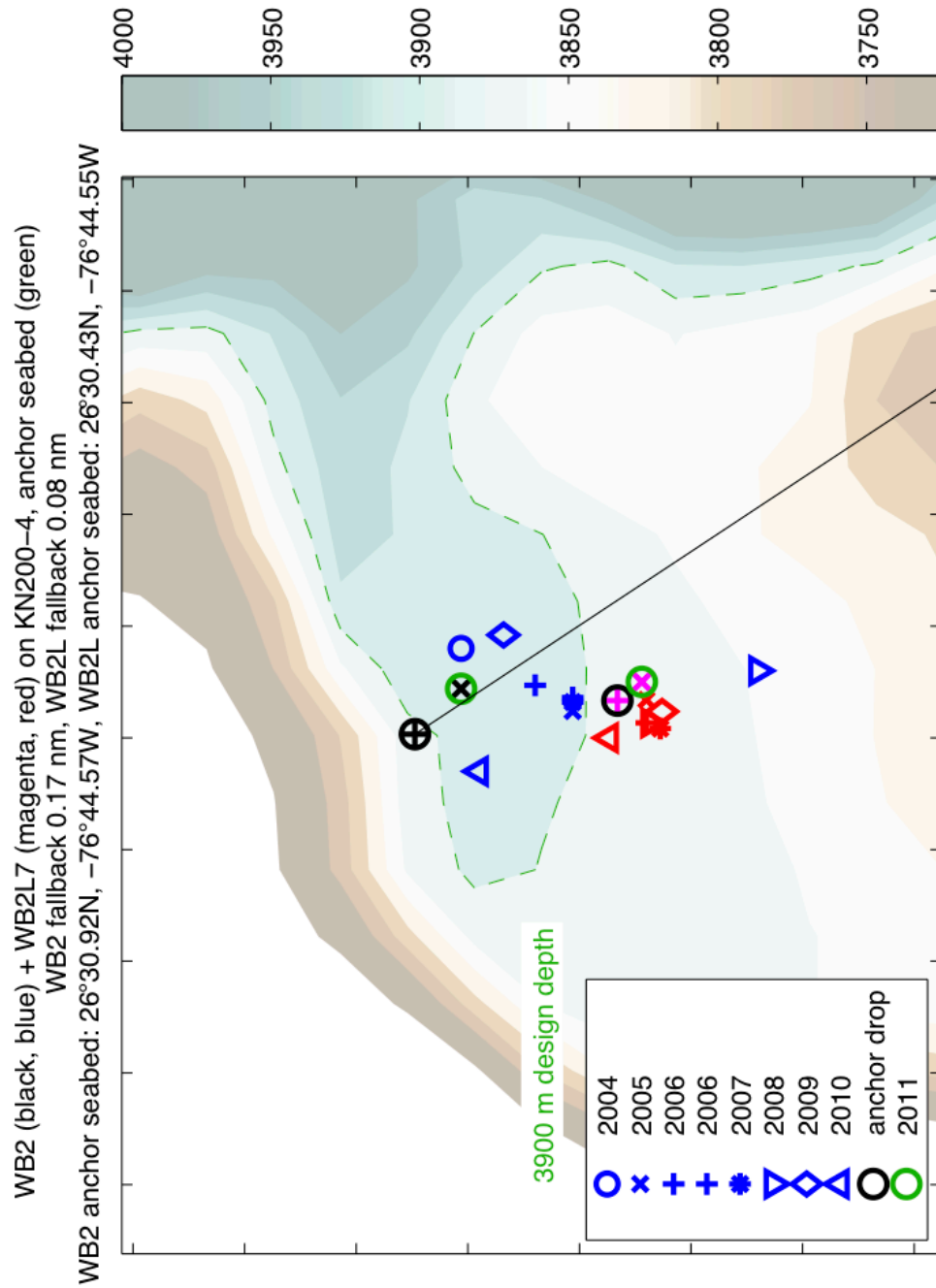
WB2 triangulation



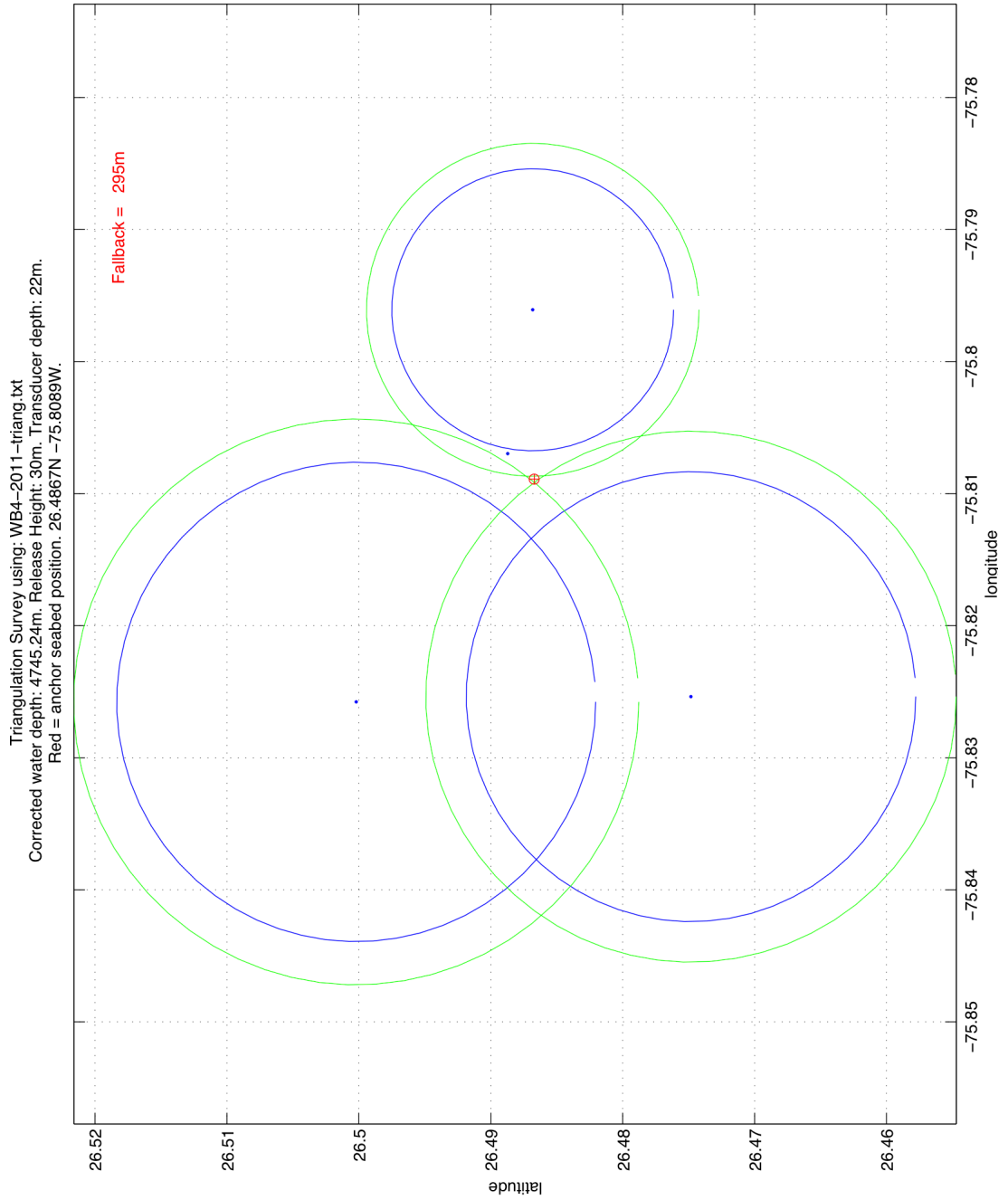
WB2L7 triangulation



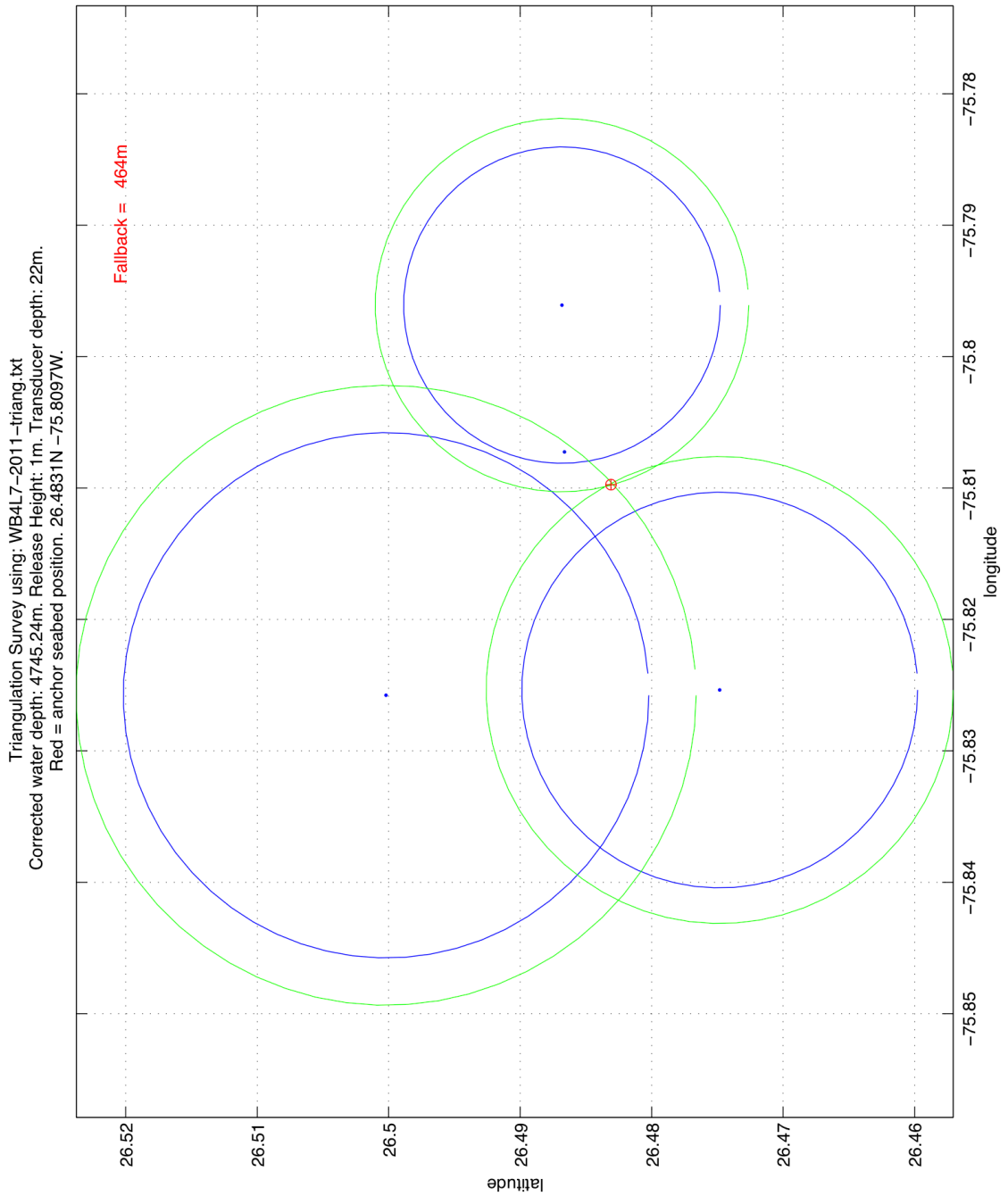
WB2 and WB2L approach and final position



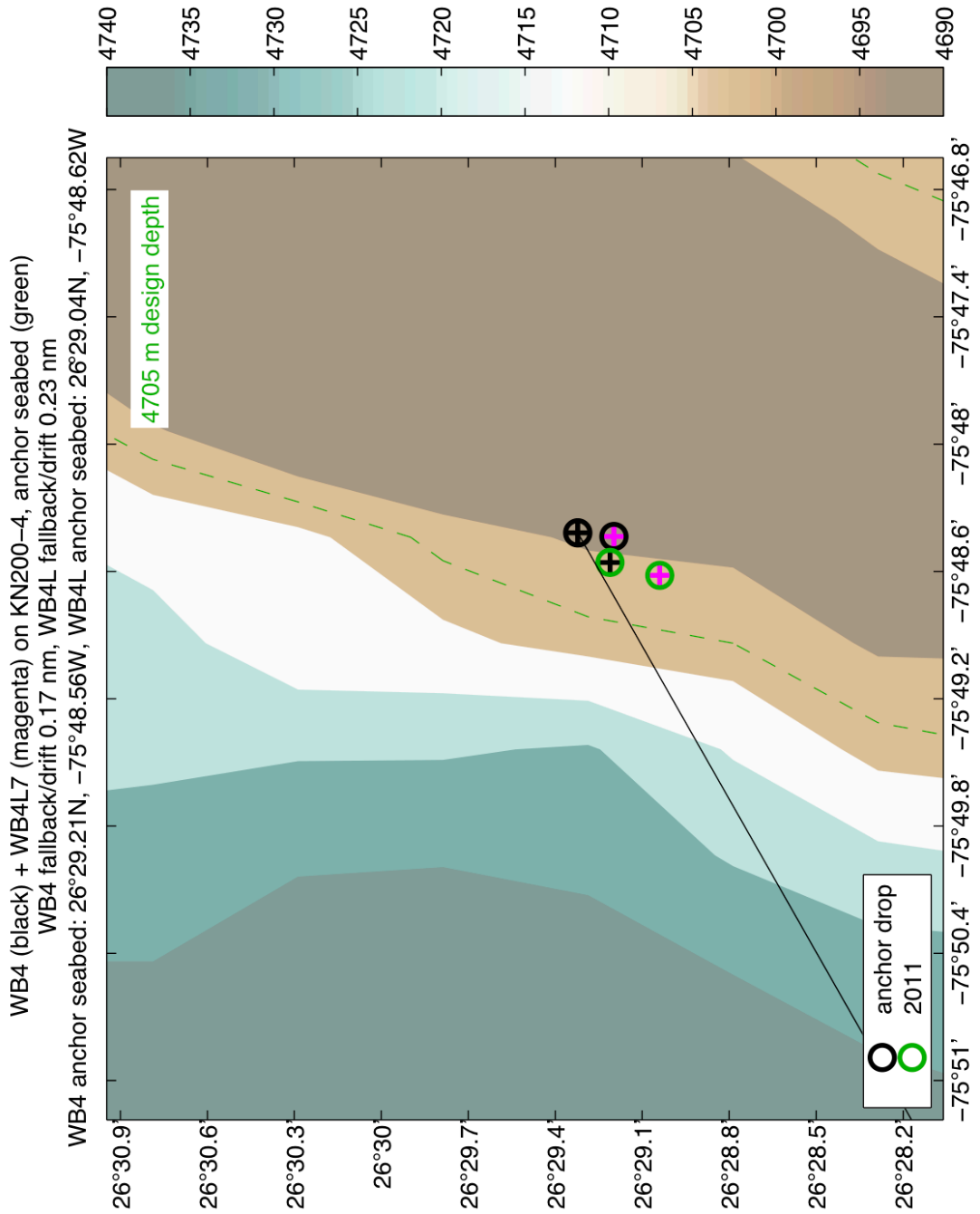
WB4 triangulation



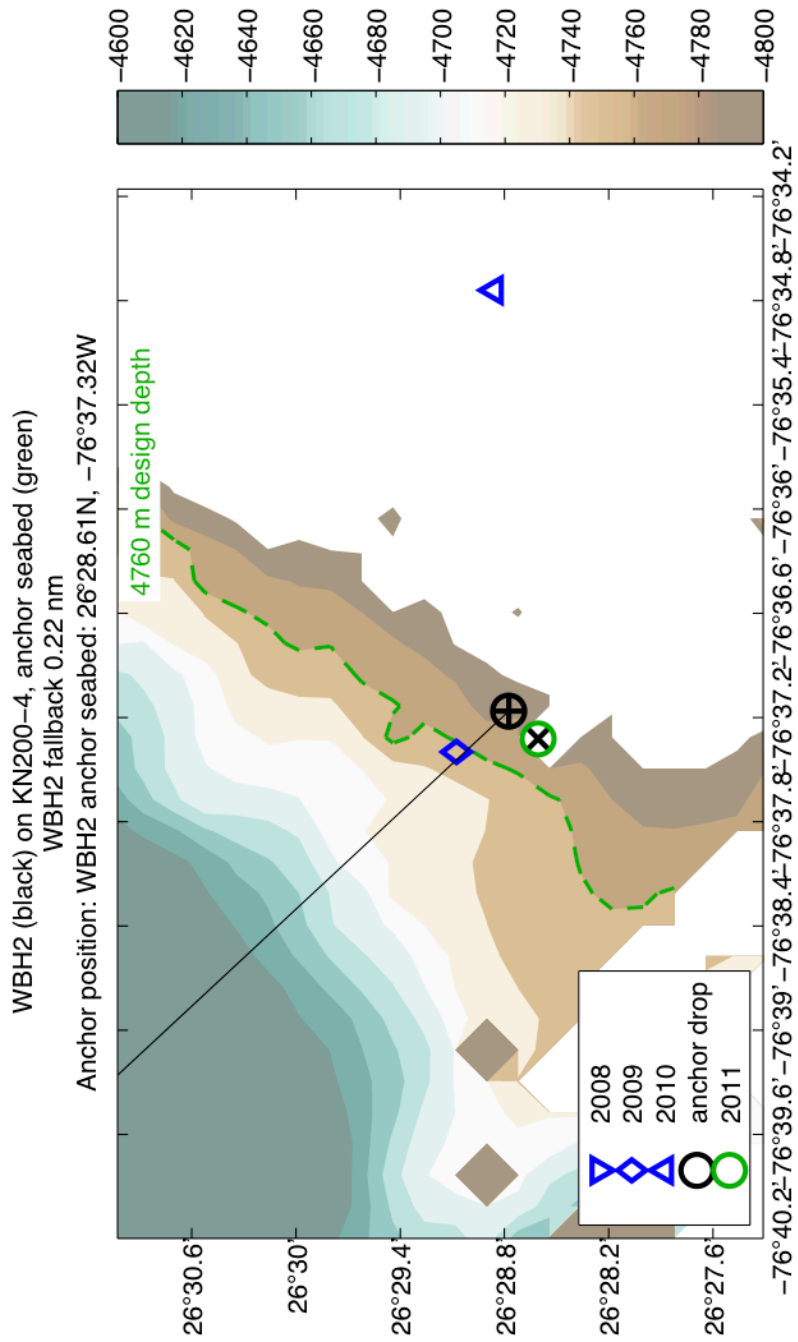
WB4L7 triangulation



WB4 and WB4L7 approach and final position

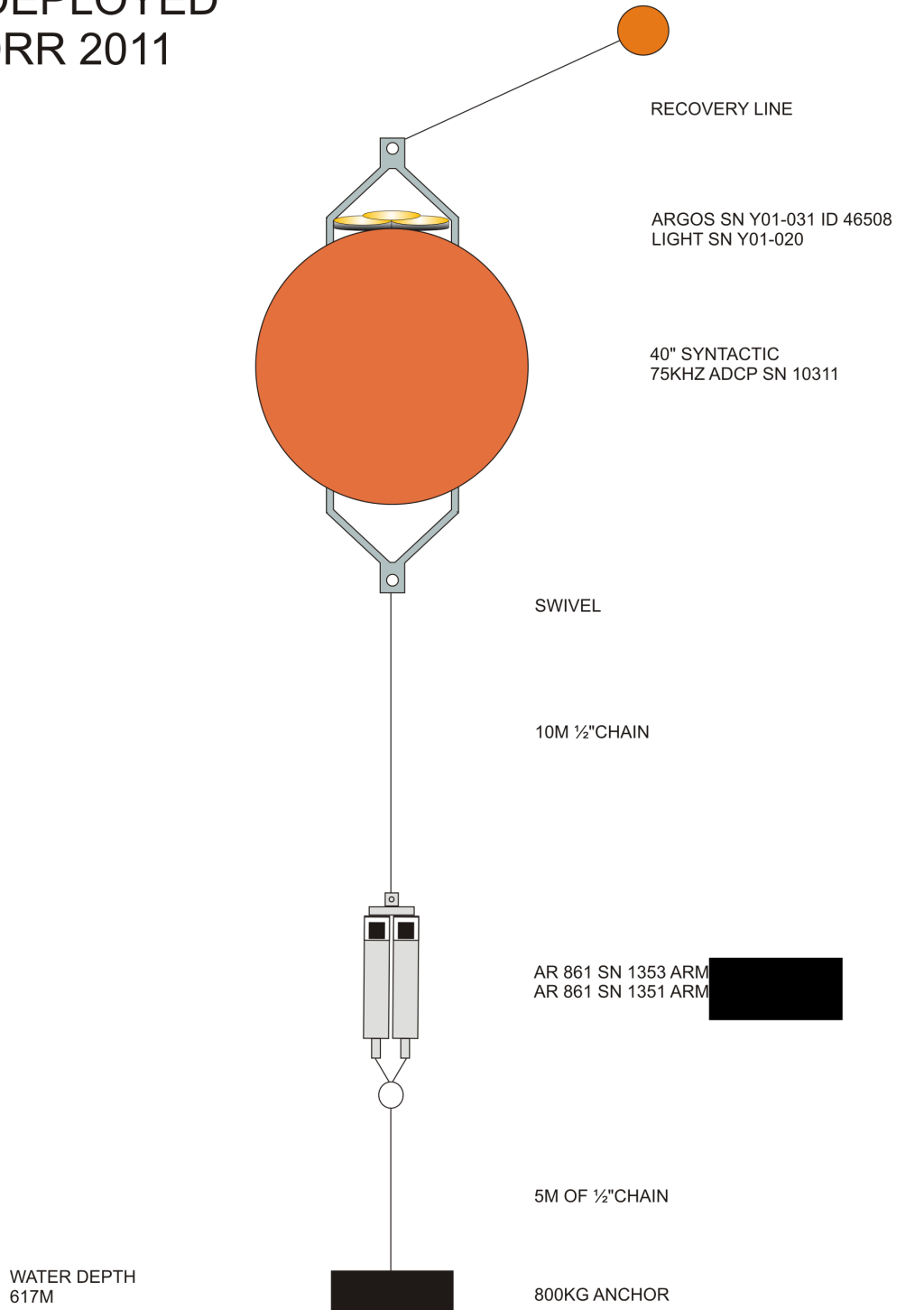


WBH2 approach and final position



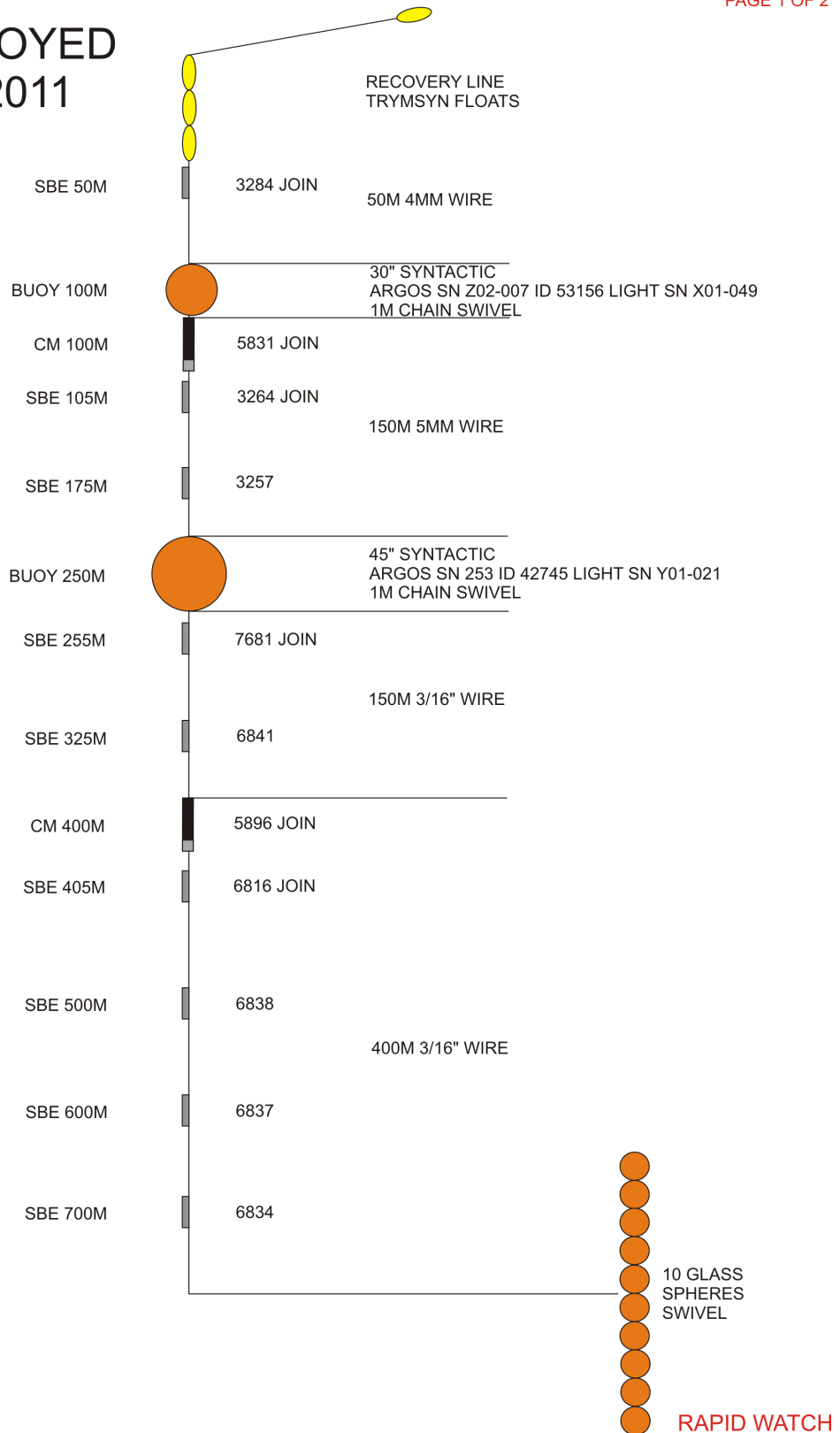
Appendix E – Mooring Diagrams as Deployed

WB ADCP
AS DEPLOYED
KNORR 2011

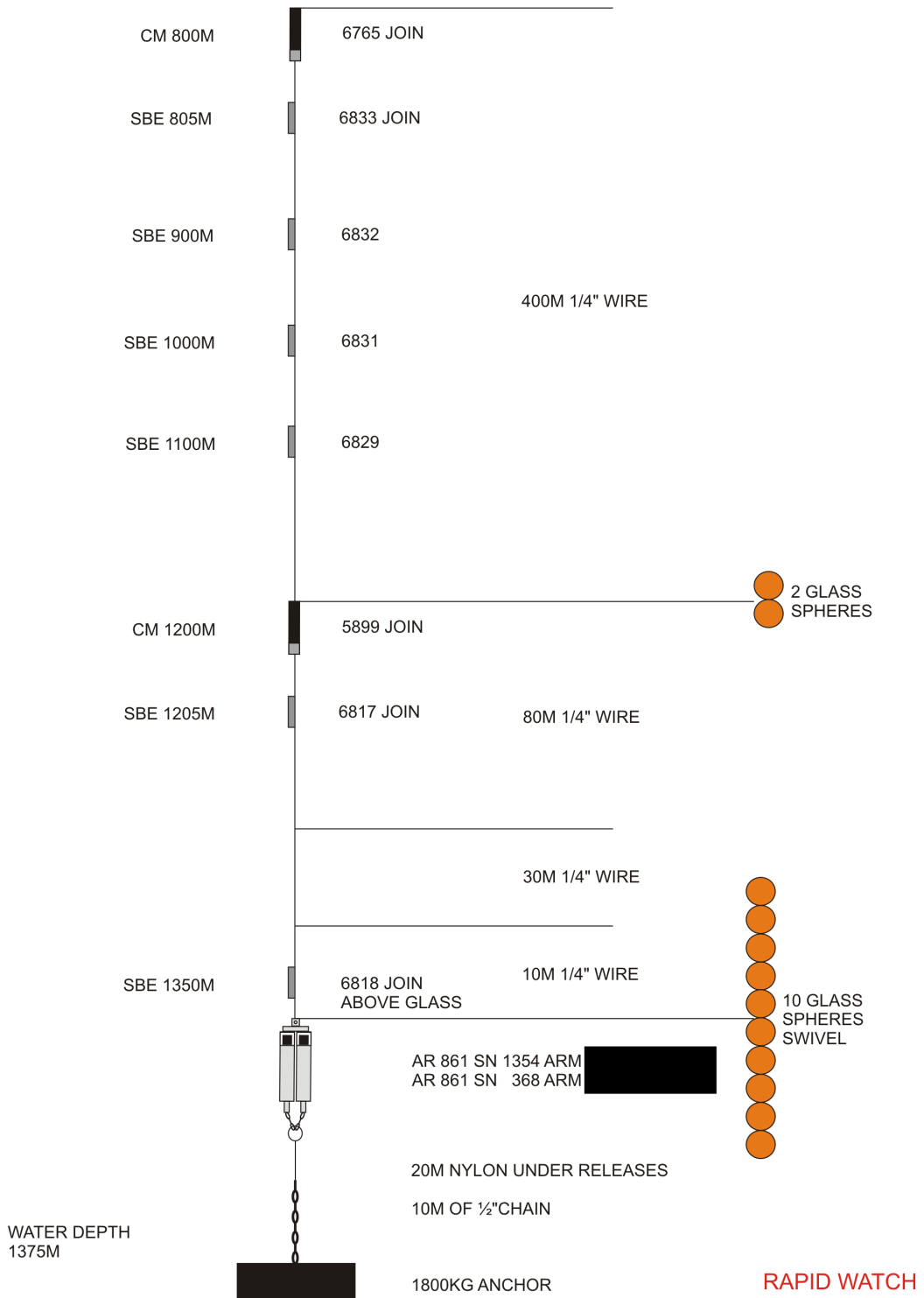


RAPID WATCH

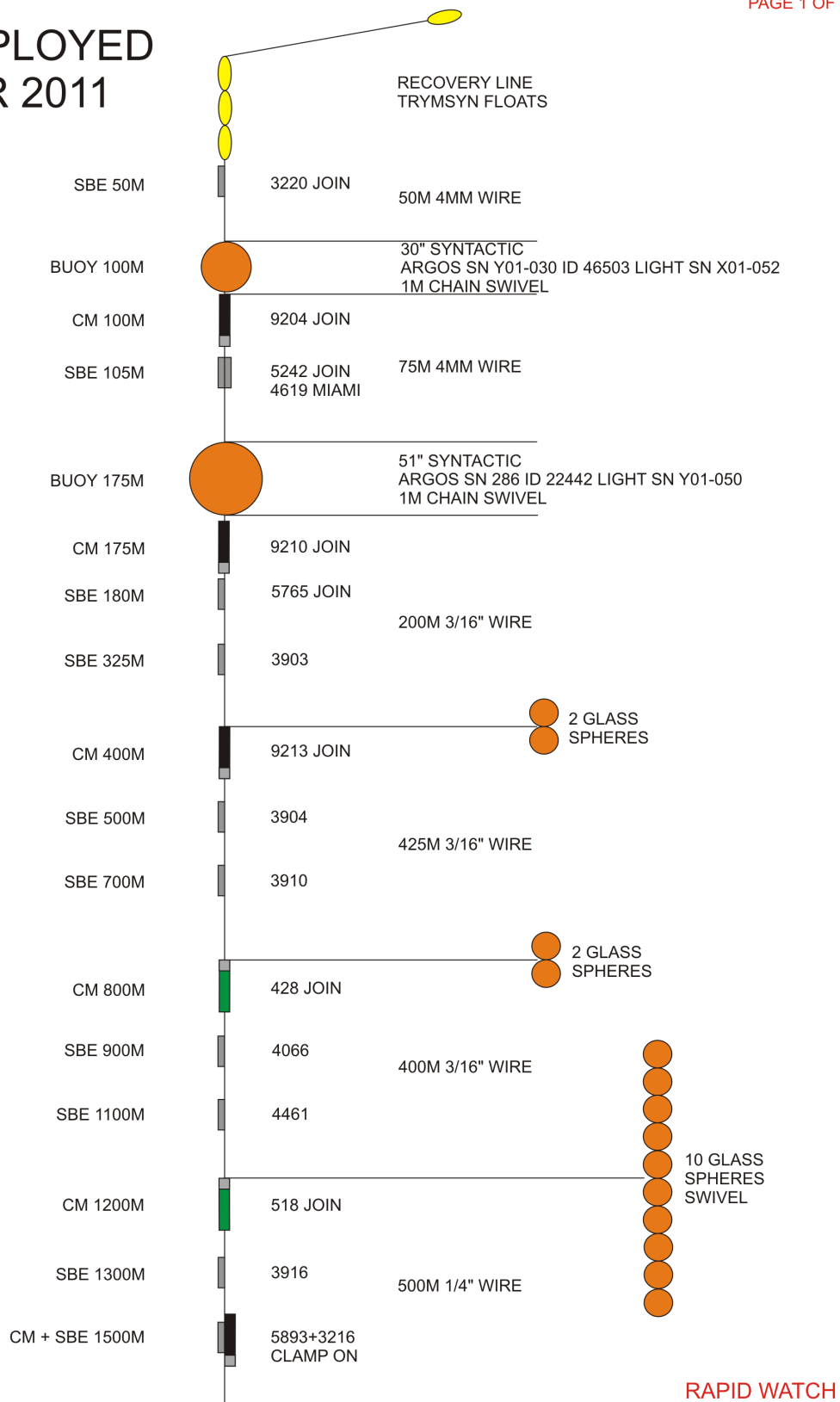
WB 1
AS DEPLOYED
KNORR 2011



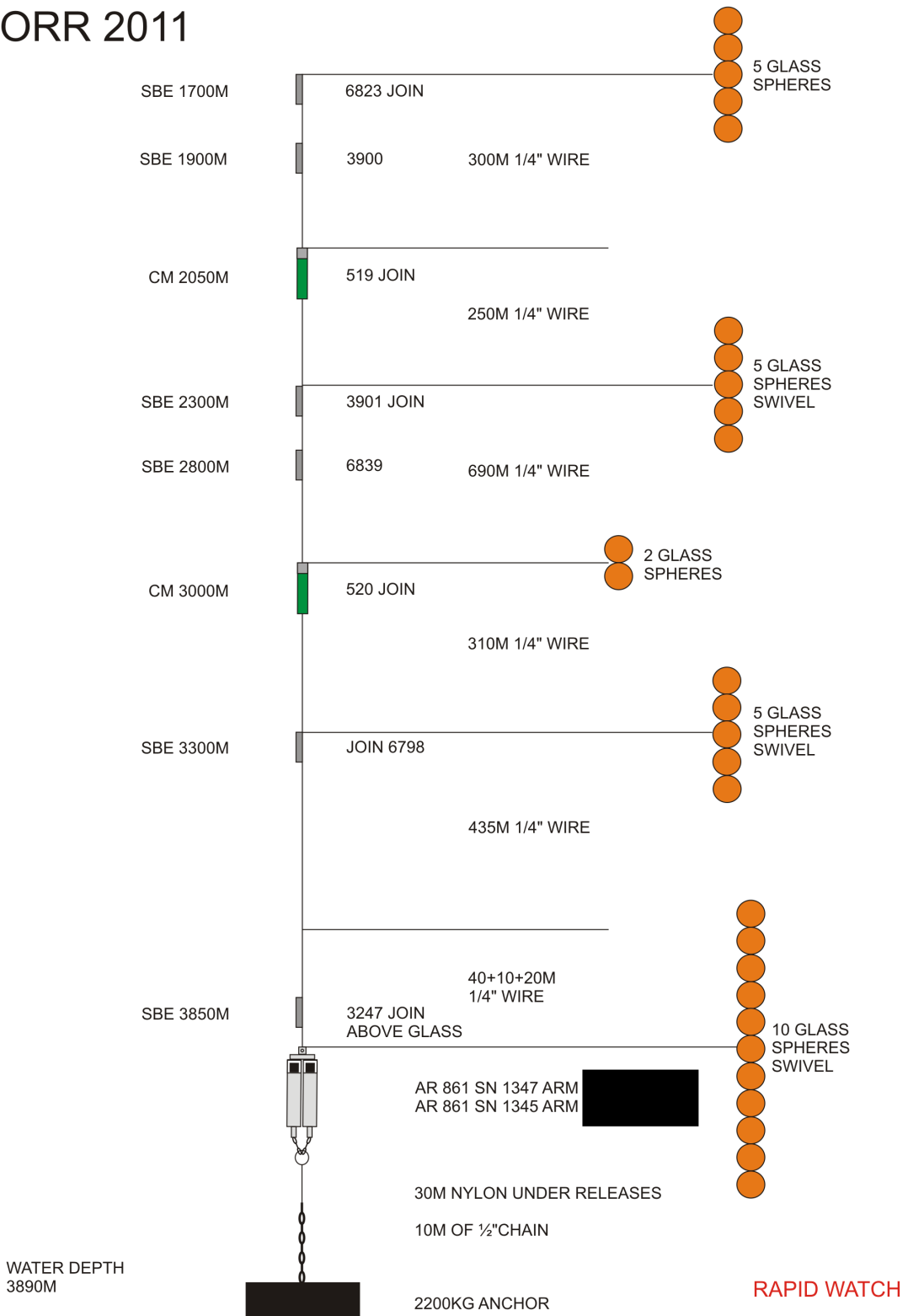
WB 1
AS DEPLOYED
KNORR 2011



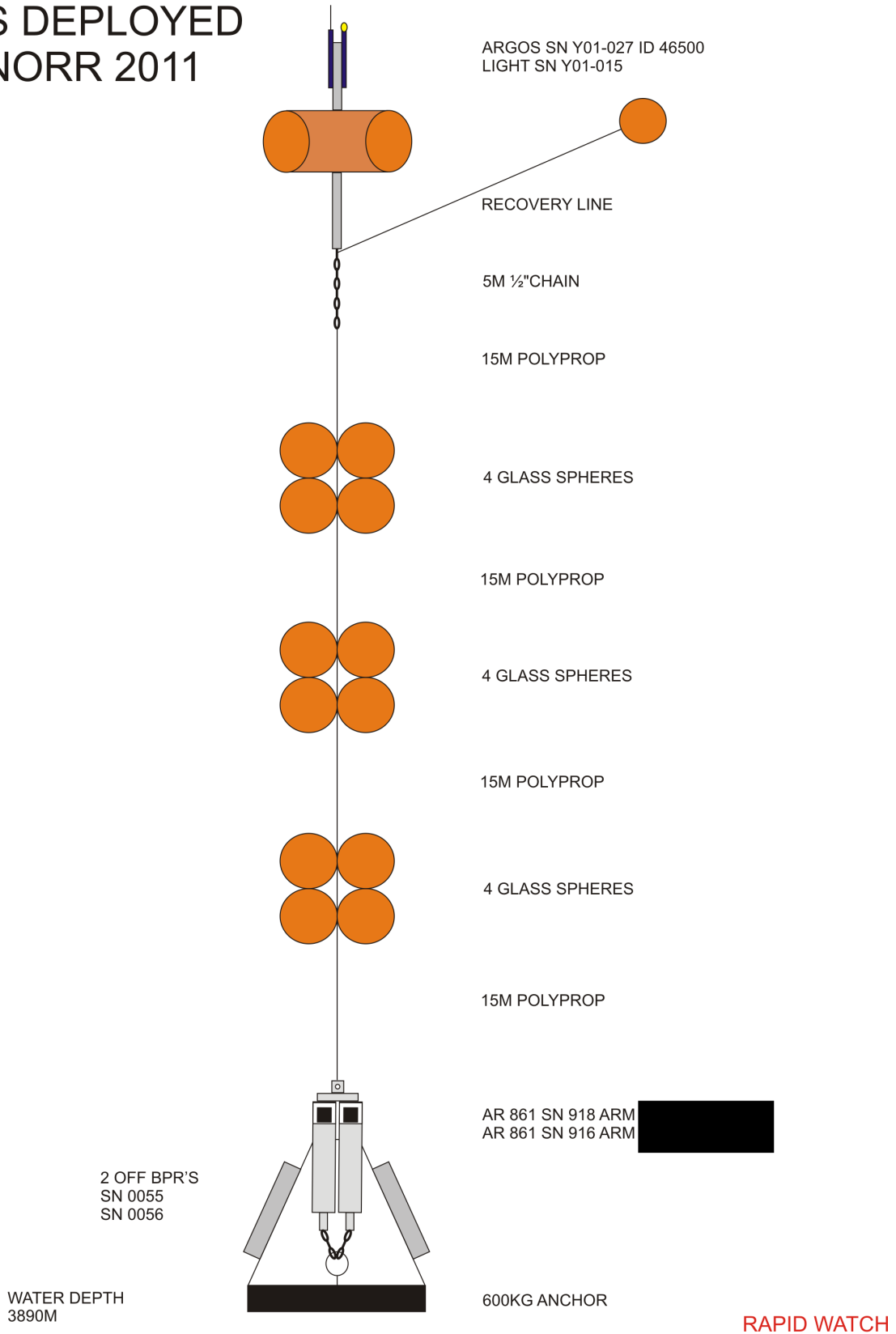
WB 2
AS DEPLOYED
KNORR 2011



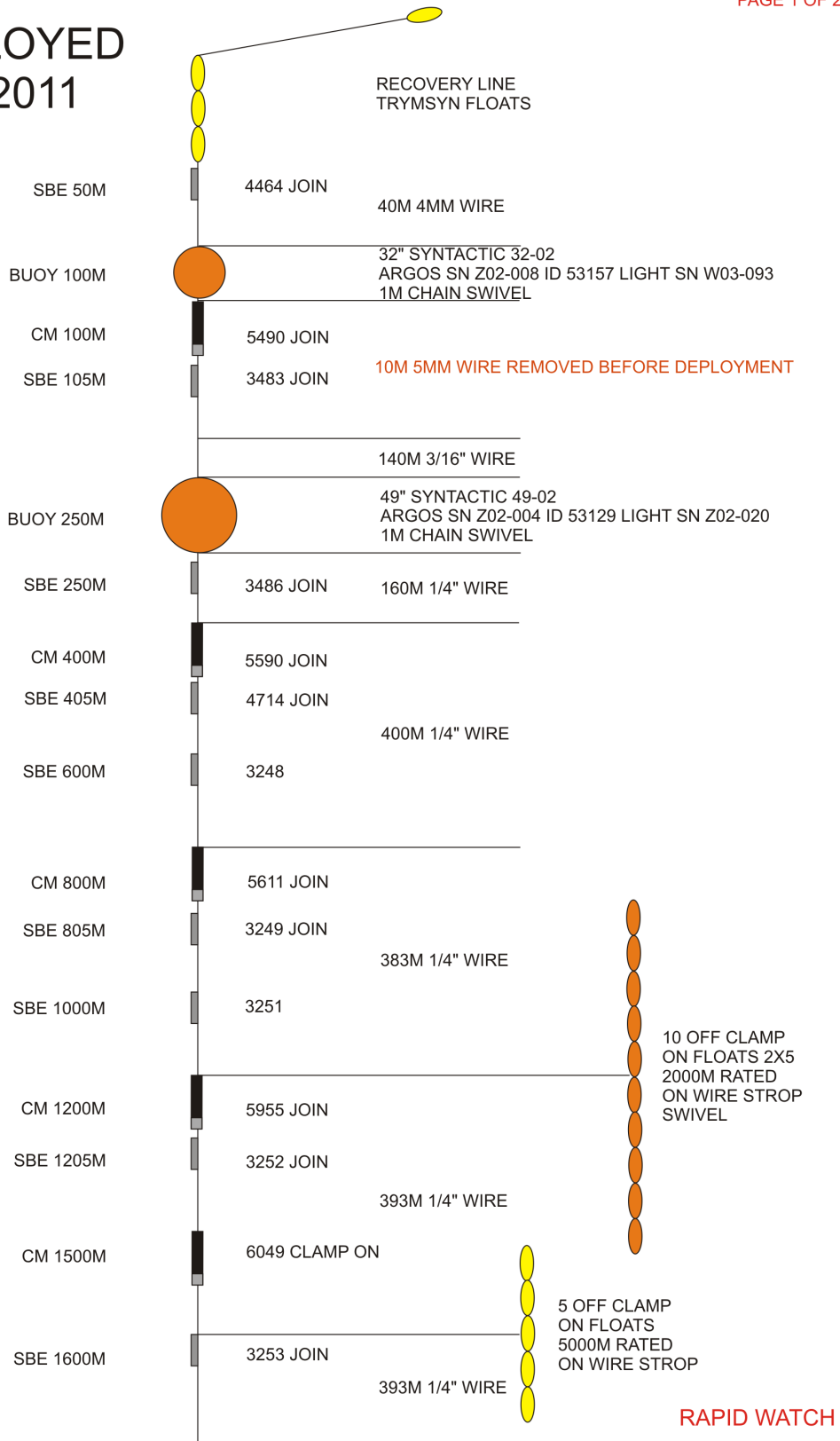
WB 2
AS DEPLOYED
KNORR 2011



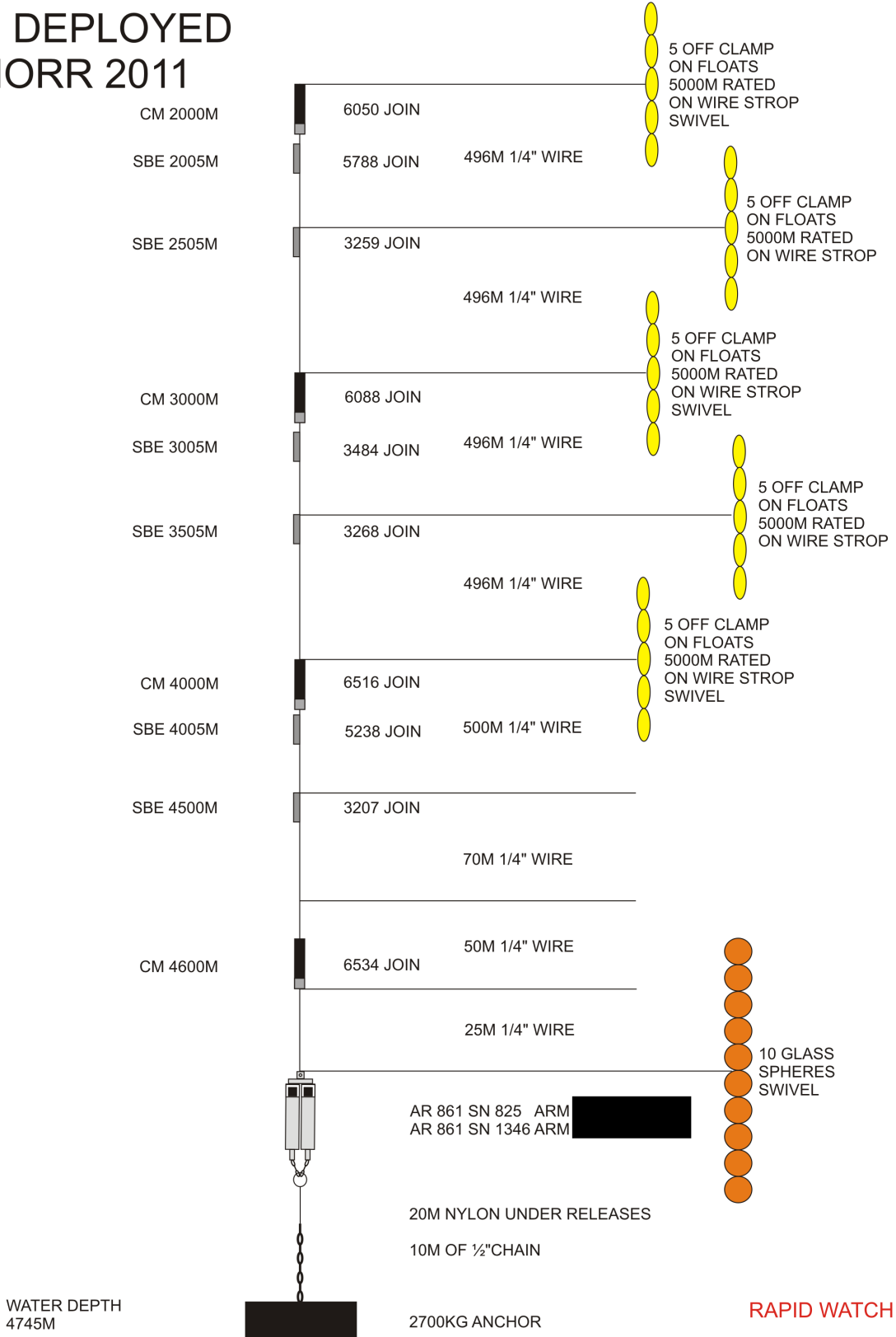
WB2L7
AS DEPLOYED
KNORR 2011



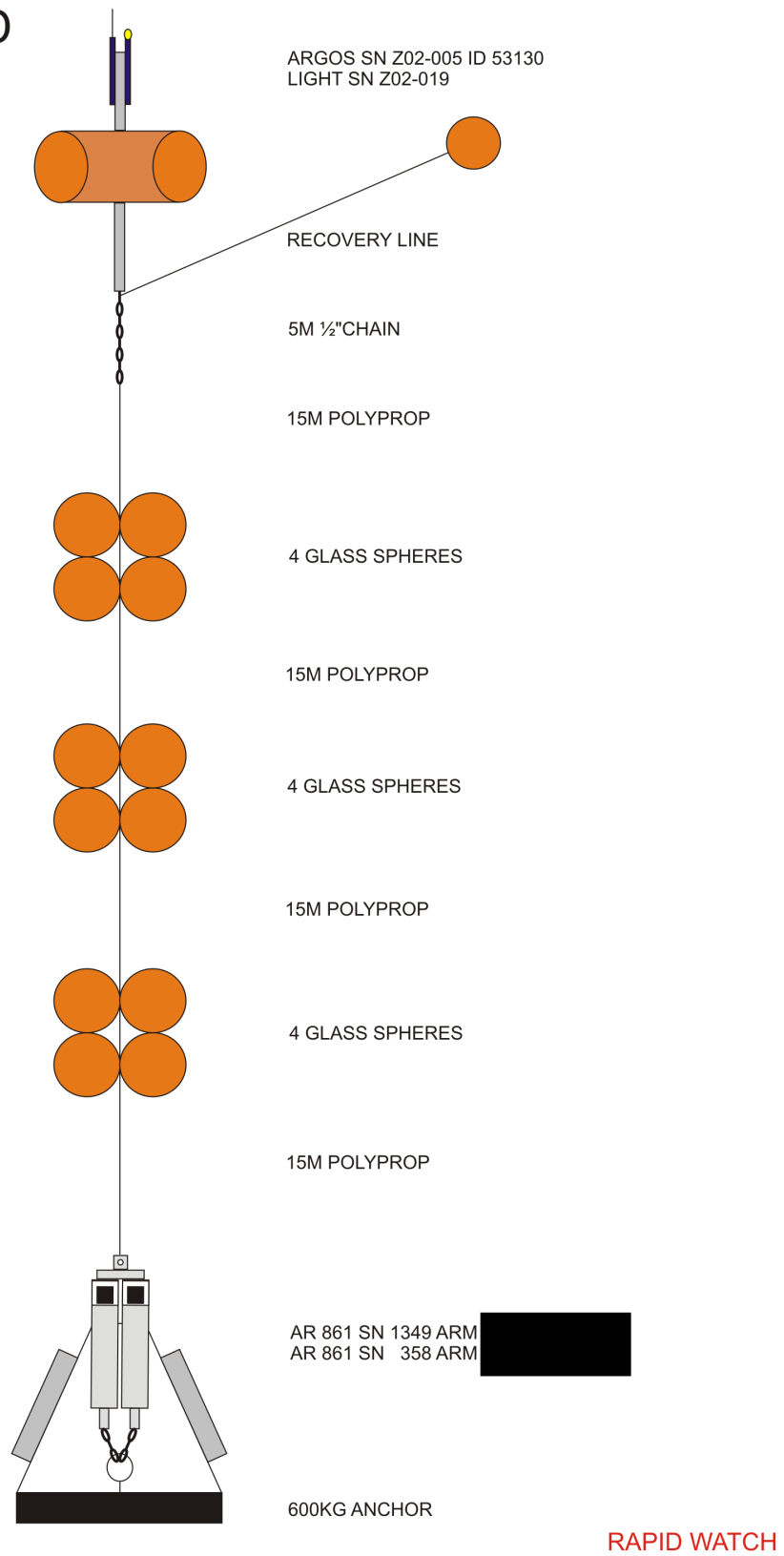
WB 4
AS DEPLOYED
KNORR 2011



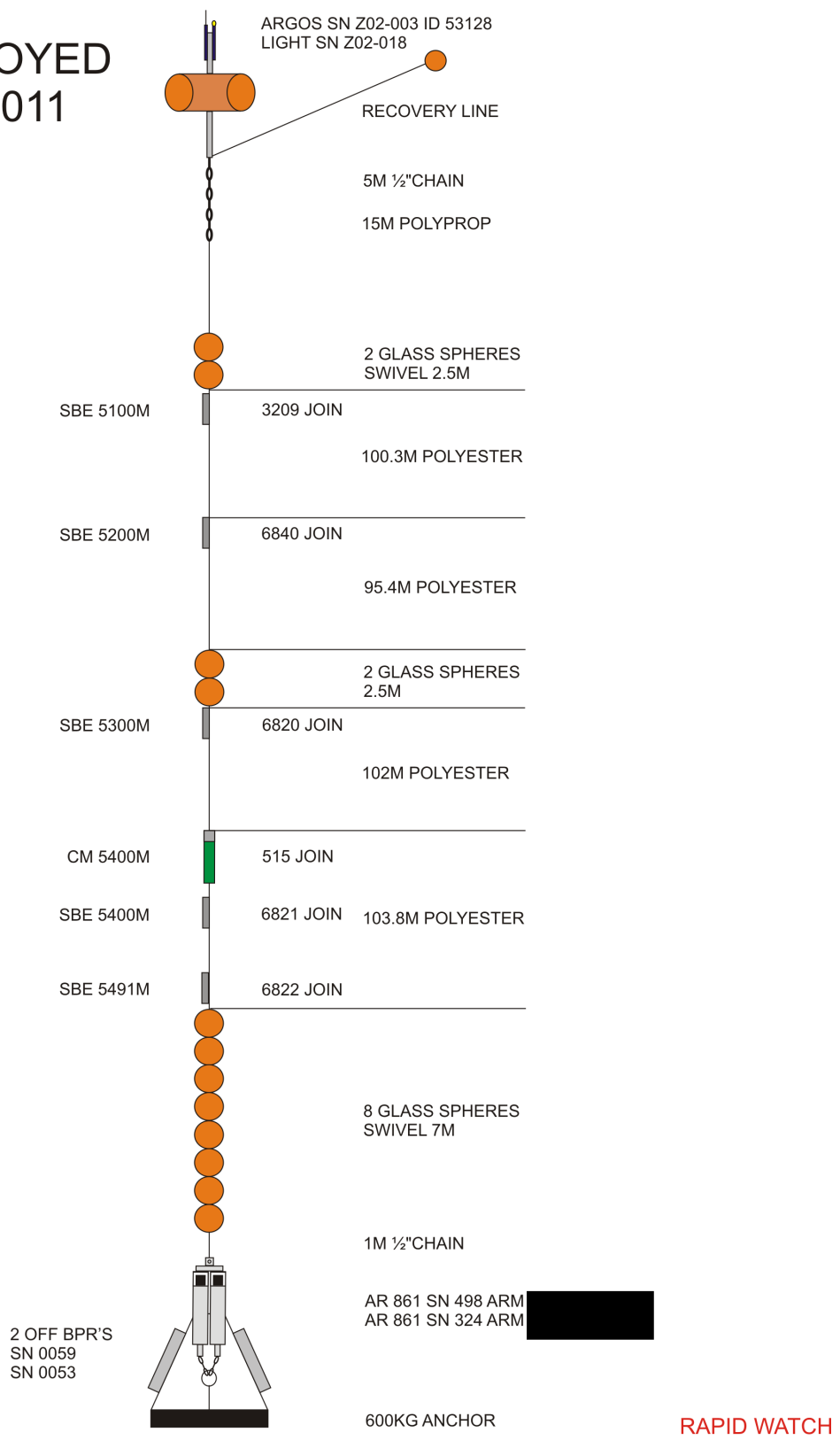
WB 4
AS DEPLOYED
KNORR 2011



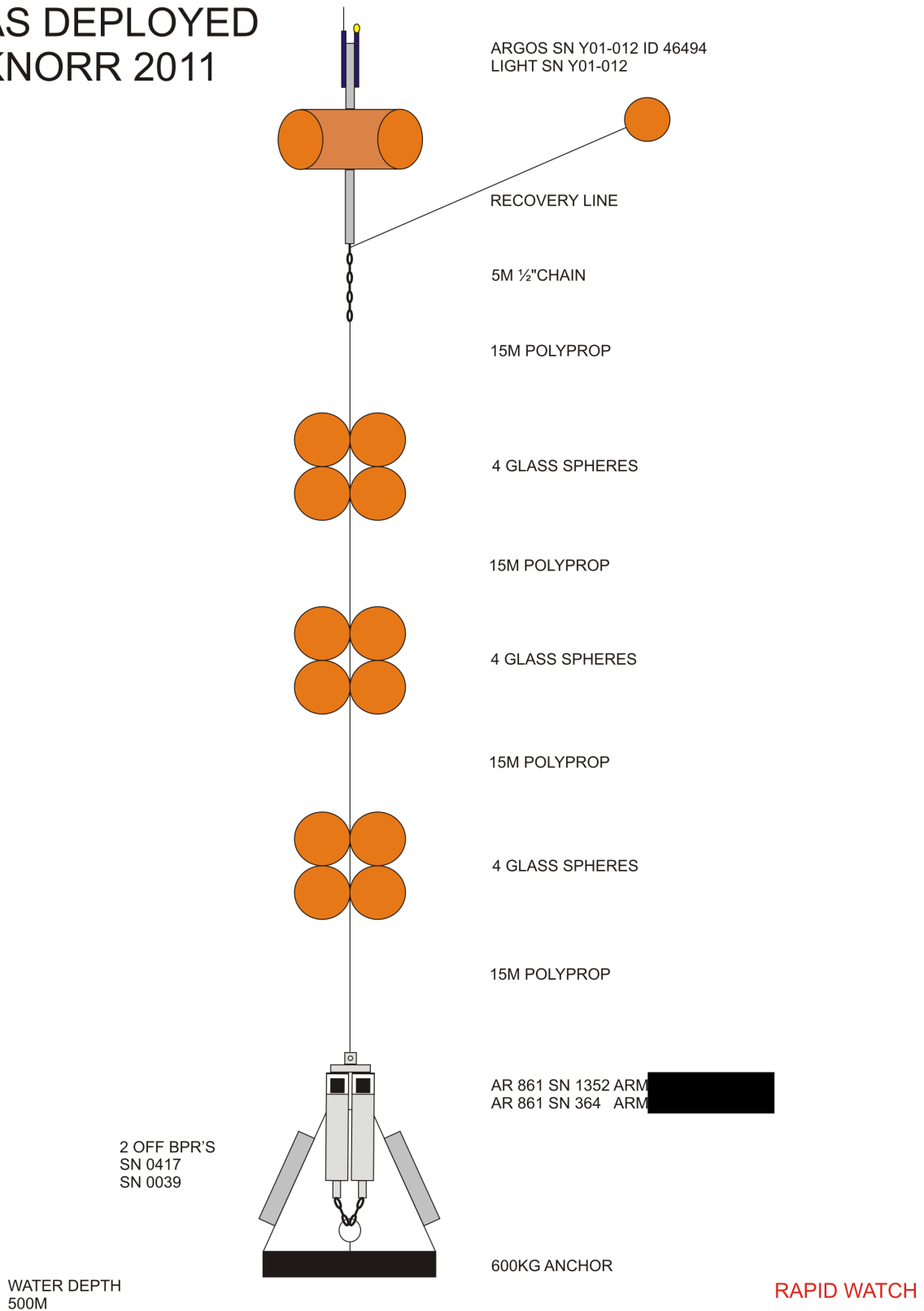
WB4L7
AS DEPLOYED
KNORR 2011



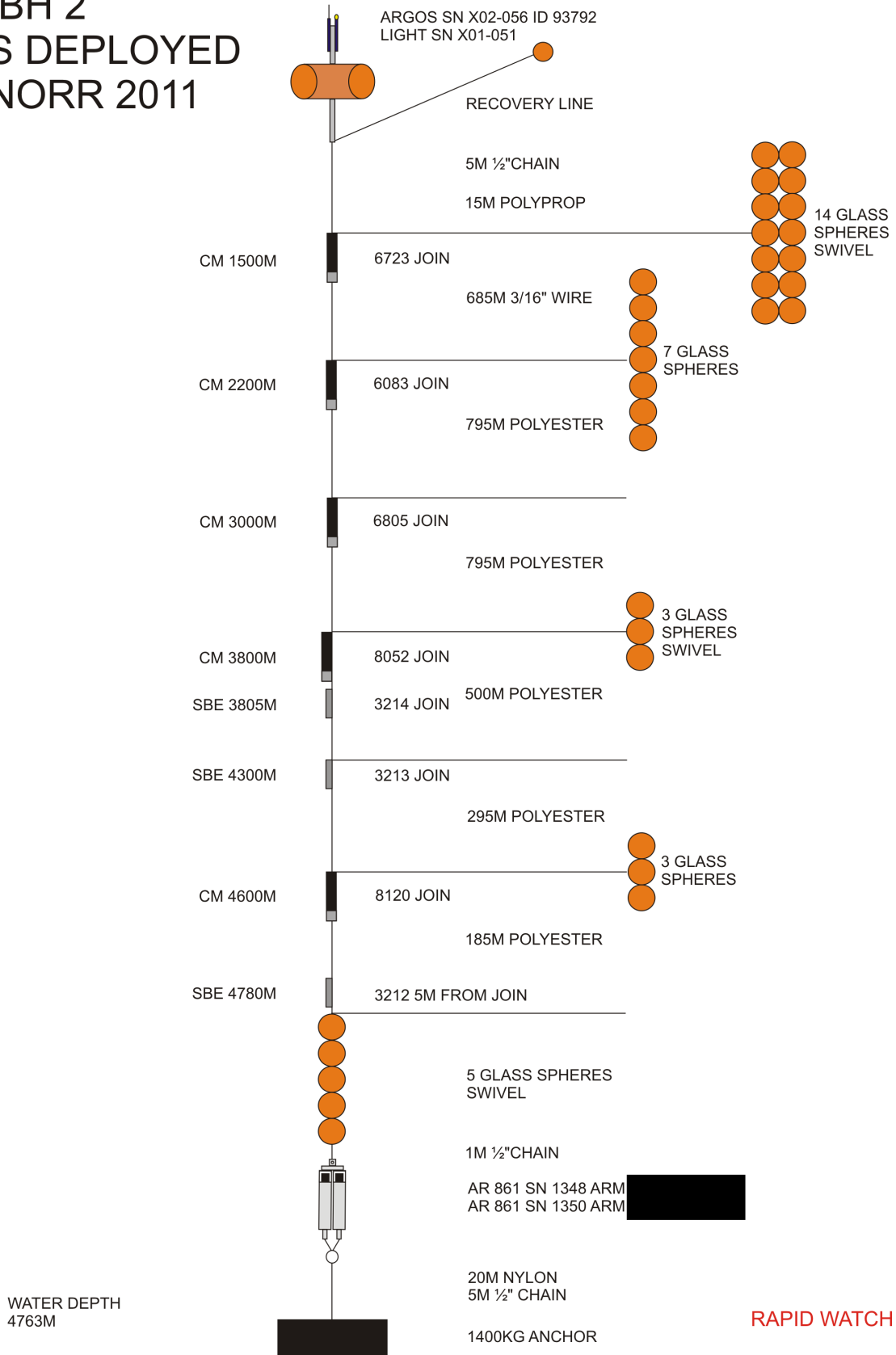
WB 6
AS DEPLOYED
KNORR 2011



WBAL2
AS DEPLOYED
KNORR 2011



WBH 2
AS DEPLOYED
KNORR 2011



Appendix F – Acoustic Release Record

| Serial No | Type | Previous Location | Current Location | Date Deployed | Position | | Water Depth | Serviced | New Batts | Bench Tested | Wire Tested | Depth Tested |
|-----------|-------|-------------------|------------------|---------------|-----------|-----------|-------------|----------|-----------|--------------|-------------|--------------|
| | | | | | Lat | Long | | | | | | |
| 1345 | AR861 | NEW | WB2 11 | 28/04/2011 | 26 31.043 | 76 44.691 | | New | New | Y | Y | 5430 |
| 1346 | AR861 | NEW | WB4 11 | 24/04/2011 | 26 29.323 | 75 48.418 | | New | New | Y | Y | 5430 |
| 1347 | AR861 | NEW | WB2 11 | 28/04/2011 | 26 31.043 | 76 44.691 | | New | New | Y | Y | 5430 |
| 1348 | AR861 | NEW | WBH2 11 | 27/04/2011 | 26 28.775 | 76 37.163 | | New | New | Y | Y | 5430 |
| 1349 | AR861 | NEW | WB4L7 | 23/04/2011 | 26 29.198 | 70 48.435 | | New | New | Y | Y | 5430 |
| 1350 | AR861 | NEW | WBH2 11 | 27/04/2011 | 26 28.775 | 76 37.163 | | New | New | Y | Y | 5430 |
| 1351 | AR861 | NEW | ADCP 11 | 30/04/2011 | 26 31.497 | 76 52.080 | | New | New | Y | Y | 4000 |
| 1352 | AR861 | NEW | WBAL2 | 30/04/2011 | 26 31.574 | 76 52.552 | | New | New | Y | Y | 4000 |
| 1353 | AR861 | NEW | ADCP 11 | 30/04/2011 | 26 31.497 | 76 52.080 | | New | New | Y | Y | 4000 |
| 1354 | AR861 | NEW | WB1 11 | 29/04/2011 | 26 30.327 | 76 49.041 | | New | New | Y | Y | 3500 |
| 916 | AR861 | D359 | WB2L7 | 28/04/2011 | 26 30.50 | 76 15.40 | | Y | Y | Y | Y | 3500 |
| 364 | AR861 | D359 | WBAL2 | 30/04/2011 | 26 31.574 | 76 52.552 | | Y | Y | Y | Y | 4000 |
| 918 | AR861 | D359 | WB2L7 | 28/04/2011 | 26 30.50 | 76 15.40 | | Y | Y | Y | Y | 3500 |
| 368 | AR861 | D359 | WB1 11 | 29/04/2011 | 26 30.327 | 76 49.041 | | Y | Y | Y | Y | 3500 |
| 258 | AR861 | D359 | KNORR | UNUSED | | | | Y | Y | | | |
| 324 | AR861 | NOC | WB6 11 | 20/04/2011 | 26 29.58 | 70 31.53 | | Y | Y | Y | Y | 5430 |
| 825 | AR861 | NOC | WB4 11 | 24/04/2011 | 26 29.323 | 75 48.418 | | Y | Y | Y | Y | 5430 |
| 358 | AR861 | NOC | WB4L7 | 23/04/2011 | 26 29.198 | 70 48.435 | | Y | Y | Y | Y | 5430 |
| 498 | AR861 | NOC | WB6 11 | 20/04/2011 | 26 29.58 | 70 31.53 | | Y | Y | Y | Y | 5430 |
| 823 | AR861 | ADCP | KNORR | | | | | Y | Y | Y | Y | |
| 906 | AR861 | WB1 10 | KNORR | | | | | Y | Y | Y | Y | 5400 |
| 223 | RT661 | WB1 10 | KNORR | | | | | Y | Y | Y | Y | 5400 |
| 354 | AR861 | WB2L5 | KNORR | | | | | Y | Y | Y | Y | 3320 |
| 264 | AR861 | WB2L5 | KNORR | | | | | Y | Y | Y | Y | 3320 |
| 1200 | AR861 | WB4 10 | KNORR | | | | | NEW | NEW | Y | Y | 5000 |
| 1242 | AR861 | WB4 10 | KNORR | | | | | NEW | NEW | Y | Y | 5000 |
| 282 | AR861 | WB4L5 | KNORR | | | | | Y | Y | Y | Y | 5120 |
| 361 | AR861 | WB6 10 | KNORR | | | | | Y | Y | Y | Y | 5200 |
| 827 | AR861 | WB6 10 | KNORR | | | | | Y | Y | Y | Y | 5200 |
| 911 | AR861 | WBH2 | KNORR | | | | | Y | Y | Y | Y | 5400 |
| 249 | AR861 | WBH2 | KNORR | | | | | Y | Y | Y | Y | 5400 |
| 910 | AR861 | WB2 10 | KNORR | | | | | Y | Y | Y | Y | 5400 |
| 256 | AR861 | WB2 10 | KNORR | | | | | Y | Y | Y | Y | 5400 |

Table F.1 Record of the acoustic releases recovered, used and tested on KN200-4.

Appendix G – Logsheets

These are scanned images due to past cases of typos being discovered in the logsheets.

RAPID-WATCH MOORING LOGSHEET

DEPLOYMENT

Mooring **WB1**

Cruise

KN200-4

NB: all times recorded in GMT

Date 29/04/2011

Site arrival time before 1700

Setup distance 0nm - 18 kt current

Start time 17:27

End time _____

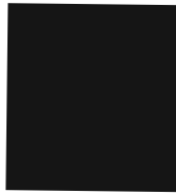
Start Position _____

Latitude _____ Longitude _____

| ITEM | SER NO | COMMENT | TIME |
|---|------------------------|-----------------------|-------|
| 1 x Trimsyn pick up float | | | 17:31 |
| 3 Trimsyn floats | | | 17:32 |
| SBE37 MicoCAT | 3284 | | 17:32 |
| 30" SYNTACTIC | 2 | | 17:34 |
| ARGOS | | Record PTT | |
| Light | | } check Rob's | |
| 1m chain and swivel | | | |
| NORTEK in frame | 5831 ✓ | Up(down) looking? | 17:34 |
| SBE37 MicoCAT | 3264 ✓ | | |
| SBE37 MicoCAT | 3257 ✓ | | 17:37 |
| 45" syntactic buoy with beacons | | | 17:49 |
| ARGOS | | Record PTT | |
| LIGHT | | | |
| 1m chain and swivel | | | |
| SBE37 MicoCAT | 7681 ✓ | | 17:51 |
| SBE37 MicoCAT | 6841 ✓ | | 17:54 |
| NORTEK in frame | 5765 5896 ✓ | | 17:59 |
| SBE37 MicoCAT | 6816 ✓ | (5m down from Nortek) | 18:00 |
| SBE37 MicoCAT | 6838 ✓ | | 18:03 |
| SBE37 MicoCAT | 6837 ✓ | | 18:06 |
| SBE37 MicoCAT | 6836 ✓ | | 18:09 |
| 10 x 17" glass | | | 18:16 |
| NORTEK in frame | 6765 ✓ | | 18:16 |
| SBE37 MicoCAT | 6822 ✓ | (5m down from Nortek) | 18:18 |
| SBE37 MicoCAT | 6832 ✓ | | 18:21 |
| SBE37 MicoCAT | 6831 ✓ | | 18:23 |
| SBE37 MicoCAT | 6829 ✓ | | 18:26 |
| 2 x 17" glass | | | 18:31 |
| NORTEK in frame | 5899 ✓ | | 18:31 |
| SBE37 MicoCAT | 6817 ✓ | (5m down from Nortek) | 18:33 |
| SBE37 MicoCAT (at 1st join above glass) | 6818 ✓ | | 18:40 |
| 10 x 17" glass | | | 18:45 |

| | | | |
|---------------------|------|----------------------|-------|
| Acoustic release #1 | 1354 | Record release codes | 18:45 |
| Acoustic release #2 | 368 | Record release codes | 18:45 |
| 20m NYLON TWIST | | | 18:45 |
| 10m 1/2" chain | | | 19:00 |
| Anchor 1800kg | | | 19:00 |

Release #1 arm code
 Release #1 release code
 Release #2 arm code
 Release #2 release code



} not independently
 checked - NUMISCA5 FOR COPIES
 + SERIAL NUMBER
 GOT FROM ROSS
 AFTER DEPLOYMENT

Anchor Drop Position

Latitude 26 30.327

Longitude 76 49.061

Uncorrected water depth

1367 (at anchor launch)

Corrected water depth

1375 (at anchor launch)



| | <u>r1</u> | <u>r2</u> | |
|---------------|-----------|-----------|----------------------------------|
| 0929 20:21:50 | — | 2248.6 | SE site 26°29.557' N 76°49.77' W |
| 20:22:27 | 2252.7 | 2253.8 | |

E site

| | | | |
|----------|--------|--------|-----------------------|
| 20:43:43 | 1972.4 | 1976.4 | 26°29.871' 76°48.105' |
| 20:44:02 | 1984.2 | 1989.0 | |
| 20:44:20 | 1994.7 | 1997.9 | |

N SITE

| | | | |
|----------|------|------|---------------------------|
| 21:10:00 | 93 | 1980 | 26°30.968' N 76°49.281' W |
| 21:10:20 | 1975 | 1973 | |
| 21:10:38 | 1967 | 1964 | |

RAPID-WATCH MOORING LOGSHEET

RECOVERY

Mooring **WB1**

Cruise **KN200-4**

NB: all times recorded in GMT

Date 29 Apr 2011

Site arrival time 13:55

Time of first ranging 13:57

Time of release 13:59

14:01 surf

Latitude _____ Longitude _____

(record positions at time of pickup only if likely to be very different from deployment position)

grapple 14:25

| ITEM | SER NO | COMMENT | TIME |
|---------------------|------------------------|--|---------------|
| Recovery line | | | 14 |
| 3 TRYMSYN floats | | | 14:30 |
| SBE37 Microcat | 5764 ✓ | some growth in cell | 14:34 |
| 30" SYNTACTIC | | br | 14:35 |
| ARGOS | | broken antenna | |
| Light | | | |
| 1m chain and swivel | | | |
| NORTEK | 5963 ✓ | (multisegmented worms) | 14:36 |
| SBE37 Microcat | 6115 ✓ | cell looks ok | 14:36 |
| SBE37 Microcat | 3919 ✓ | light growth | 14:42 |
| 45" syntactic buoy | | | 14:47 |
| ARGOS | | | |
| LIGHT | | | |
| 1m chain and swivel | | | |
| SBE37 Microcat | 6116 ✓ | | 14:48 |
| SBE37 Microcat | 3928 ✓ | | 14:55 |
| RCM11 | 301 ✓ | | 14:57 |
| SBE37 Microcat | 6117 ✓ 3930 | | 14:59 |
| SBE37 Microcat | 3930 ✓ | missing end cap, guard + cell was down the line | 15:01 |
| SBE37 Microcat | 6118 ✓ | | 15:05 |
| SBE37 Microcat | 3931 ✓ | | 15:06 |
| 10 x 17" glass | | | |
| RCM11 | 302 ✓ | tangled w/glass | 15:11 |
| SBE37 Microcat | 6119 ✓ | | |
| SBE37 Microcat | 3932 ✓ | missing guide | 15:18 |
| SBE37 Microcat | 6120 ✓ | loose guide | 15:19 |
| SBE37 Microcat | 6324 ✓ | | 15:22 |
| 2 x 17" glass | | | 15:25 |
| RCM11 | 303 ✓ | | 15:25 |
| SBE37 Microcat | 6321 ✓ | | 15:24 |
| SBE37 Microcat | 7723 ✓ | | 15:31 |
| 10 x 17" glass | | tangled | |

RAPID-WATCH MOORING LOGSHEET

RECOVERY

0

Mooring **WB2L5**

Cruise

KN200-4

NB: all times recorded in GMT

Date 28 Apr 2011 Site arrival time _____

Time of first ranging 18:11

surf 19.03

Time of release 18:15

Latitude _____ Longitude _____

(record positions at time of pickup only if likely to be very different from deployment position)

| ITEM | SER NO | COMMENT | TIME |
|-----------------------------------|-------------------------------|---------|---------|
| 17" glass | | | 19:15 |
| Recovery line | | | |
| Billings Float with VHF and Light | 101-140 101-145 | N08-027 | |
| 5m of 3/8" chain | | | |
| 4 x 17" glass | | | 19:21 |
| 15m polyprop | | | |
| 4 x 17" glass | | | 19:23 |
| 15m polyprop | | | |
| BPR #1 in tripod | 34 | | } 19:27 |
| BPR #2 in tripod | 36 | | |
| Release #1 in tripod | | | |
| Release #2 in tripod | | | |

Ascent rate 81

Time at end of recovery _____

Ranging

| Time | Range 1 | Range 2 | Command /comment |
|----------|---------|---------|------------------|
| 18:11:23 | — | 3861.7 | V - 12.7 |
| 18:12:12 | — | 3859.6 | V - 12.7 |
| 18:13:11 | 3858.8 | 3858.0 | ARM + REL REL OK |
| 18:13:47 | 3831.1 | 3822.3 | } 86 m/min |
| 18:14:48 | 3745 | 3736.7 | |
| 18:15:47 | 3664.0 | 3654.8 | 81 m/min |
| | | | |
| | | | |
| | | | |
| | | | |

sin arm
354

RAPID-WATCH MOORING LOGSHEET

DEPLOYMENT

Mooring **WB2L7**

Cruise **KN200-4**

NB: all times recorded in GMT

Date 28 Apr 2011
 Start time 20:15

Site arrival time _____
 End time _____

| ITEM | SER NO | COMMENT | TIME |
|-----------------------------|---------|-------------------------|-------|
| 12 " glass pick up float | | | 20:15 |
| 15m polyprop | | | |
| Billings Float with beacons | | | 20:15 |
| Argos Beacon | Y01-027 | Record PTT number 46504 | |
| Light | Y01-015 | | |
| 5m of 1/2" chain | | | |
| 15m of polyprop | | | |
| 4 x 17" glass | | | |
| 15m polyprop | | | 20:17 |
| 4 x 17" glass | | | |
| 15m polyprop | | | 20:19 |
| 4 x 17" glass | | | |
| 15m polyprop | | | |
| BPR #1 in tripod | 0056 | | |
| BPR #2 in tripod | 0055 | | |
| Release #1 in tripod | 918 | Record release codes | |
| Release #2 in tripod | 916 | Record release codes | |
| Anchor 500 KG | | | 20:19 |

Argos beacon #1 ID (PTT)

Release #1 arm code

Release #1 release code

Release #2 arm code

Release #2 release code

Anchor Drop Position

Latitude _____

Longitude _____

Uncorrected water depth

_____ (at anchor launch)

Corrected water depth

_____ (at anchor launch)



site 1

| | | |
|----------|---------------|--------|
| 20:48:30 | n1 (redacted) | n2 |
| 20:49:30 | 3435 | 3388.7 |
| 20:51:33 | 3563 | 3442 |
| 20:53:42 | 3700 | 3569 |
| 20 56 55 | 3922 | 3708 |
| 20 58:55 | 4064.9 | 4074 |
| 21 00 25 | 4176. | 4185 |

| | | |
|---------------|-----------|-----------|
| <u>site 1</u> | <u>n1</u> | <u>n2</u> |
| 210125 | 4239 | 4237.7 |
| 210150 | 4235.8 | 4234.9 |
| <u>site 2</u> | | |
| 212020 | 4153.7 | 4153.8 |
| 2039 | 4155.4 | 4155.6 |

site 3

| | | |
|----------|------|------|
| 21:45:00 | 4494 | 4494 |
| 21:45:21 | 4494 | 4493 |

RAPID-WATCH MOORING LOGSHEET

DEPLOYMENT

Mooring **WB2**

Cruise **KN200-4**

NB: all times recorded in GMT

Date 28 Apr 2011 / fair wind
 Setup distance 2 nm / upcurrent
 Start time 13:08
 Start Position
 Latitude 26°29.152' Longitude 76°43.442'

Site arrival time before 12 GMT
 End time _____

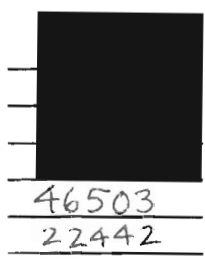
| ITEM | SER NO | COMMENT | TIME |
|----------------------------|---------|--|-------|
| 1 x Trimsyn pickup float | | | 13:08 |
| 3 x Trimsyn floats | | | |
| SBE 37 MicroCAT | 3220 | | 13:09 |
| 30" SYNTACTIC with beacons | | | 13:13 |
| ARGOS beacon | Y01-030 | Record Argos ID 46503 | |
| Light | X01-052 | | |
| 1m chain and swivel | | | |
| RCM11 NORTEK | 9204 | above both cage glass & helms, <1m apart | 13:13 |
| SBE 37 MicroCAT | 5242 | (5m down from RCM11) & 4619 | 13:16 |
| 51" syntactic with beacons | | | 13:28 |
| ARGOS beacon | 286 | Record Argos ID 22442 | |
| Light | X01-050 | | |
| 1m chain with swivel | | | |
| RCM11 NORTEK | 9210 | | 13:28 |
| SBE 37 MicroCAT | 5765 | (5m down from RCM11) | 13:29 |
| SBE 37 MicroCAT | 3903 | | |
| 2 x 17" glass | | | |
| RCM11 NORTEK | 9213 | | 13:40 |
| SBE 37 MicroCAT | 43904 | | 13:44 |
| SBE 37 MicroCAT | 3910 | | |
| 2 x 17" glass | | | |
| RCM11 | 428 | | 13:54 |
| SBE 37 MicroCAT | 4066 | | |
| SBE 37 MicroCAT | 4461 | | 14:02 |
| 10 x 17" glass | | | 14:07 |
| Swivel | | | |
| RCM11 | 518 | Some question about integrity of frame | 14:08 |
| SBE 37 MicroCAT | 3916 | | 14:12 |
| NORTEK in frame | 5893 | 3 paired | 14:18 |
| SBE37 MicroCAT | 3216 | (5m down from Nortek) | |
| 5 x 17" glass | | | |
| Swivel | | | |
| SBE 37 MicroCAT | 6823 | (5m down from glass) | |

1.9nm to target
 4.45 ETime
 1.3 kt thru water

| | | | |
|-----------------|---|----------------------|-------------|
| SBE 37 MicroCAT | 3900° | | |
| RCM11 | 519° | | |
| 5 x 17" glass | | | 14:45 |
| Swivel | | | |
| SBE 37 MicroCAT | 3901 (5m down from glass) | | 14:45-14:56 |
| SBE 37 MicroCAT | 6839 | | 14:57 |
| 2 x 17" glass | | | |
| RCM11 | 520 | | 15:04 |
| 5 x 17" glass | | | 15:13 |
| SBE 37 MicroCAT | 6798 (5m down from glass) | | 15:14 |
| SBE 37 MicroCAT | 3247 (at 1 st join above glass) 45m above join | | 15:32 |
| 11 x 17" glass | | | 15:35 |
| Swivel | | | |
| Release #1 | 1345 | Record release codes | 15:38 |
| Release #2 | 1347 | Record release codes | |
| 30M nylon | | | |
| 10M 1/2" chain | | | |
| Anchor 2200 KG | | | 17:21:33 |

START TOWING
15:50
15:50

Release #1 arm code
 Release #1 release code
 Release #2 arm code
 Release #2 release code
 Argos beacon #1 ID
 Argos beacon #2 ID
 Anchor Drop Position
 Latitude 26°31.0425
 Uncorrected water depth
 Corrected water depth



46503
22442

Longitude 76°44.6905
 (at anchor launch)
 (at anchor launch)

Towing 0.2 nm past
 drop point
 Echo sounder not working
 as passed over anchor

arm

| | ~1 | ~2 | | site 1 (0920) | ~1 | ~2 |
|----------|--------|--------------|--------------------|---------------|--------|--------|
| 17:31:38 | #379 | echo sounder | | | | |
| 17:32:20 | 2028.4 | 2045.4 | } 141 m/min | 20:50:37 | 4310. | 4309 |
| 17:33:20 | 2169 | 2186 | | 20:50:57 | 4307.6 | 4306.7 |
| 17:34:20 | 2334.5 | 2350.6 | | | | |
| 17:40:00 | 3162.9 | 3178.5 | } 128 m/min | site 2 (0920) | | |
| 17:41:00 | 3293.3 | 3306.3 | | 21:21:12 | 4364.9 | 4366.2 |
| | | | | 21:21:31 | 4368.2 | 4368.3 |
| 17:44:00 | ~ | ~ | | site 3 | | |
| 17:44:19 | 3708.8 | 3722.4 | | 21:46:12 | 4198 | 4198 |
| 17:45:19 | 3827.8 | 3827.6 | } 23 min to bottom | 21:46:32 | 4198 | 4198 |
| 17:45:45 | 3828.4 | 3829.7 | | | | |

RAPID-WATCH MOORING LOGSHEET

RECOVERY

Mooring **WB2**

Cruise **KN200-4**

NB: all times recorded in GMT

Date ~~27/4/11~~ 27/4/11

Site arrival time 16:36

Time of first ranging 16:38

Time of release 16:52

on surf 16:55 range 10 up @ 17:10

Latitude approx 26° 31.4'



Longitude 76° 44.78'

+ approach FISHING VESSEL

(record positions at time of pickup only if likely to be very different from deployment position)

17:40 hooked

| ITEM | SER NO | COMMENT | TIME |
|----------------------|--------|------------------------------------|-------|
| Recovery line | | | |
| 3 x TRYMSYN floats | | | 17:44 |
| SBE 37 MicroCAT | 3223 ✓ | Overspinn - light fuzz in cell | 17:48 |
| 30" SYNTACTIC | | | 17:53 |
| ARGOS beacon | | Record Argos ID | |
| Light | | Broke antenna while moving ball | |
| 1m chain and swivel | | | |
| RCM11 | 305 ✓ | | 17:53 |
| SBE 37 MicroCAT | 5239 ✓ | 1m below join, light fuzz in cell? | 17:56 |
| 51" syntactic buoy | | | 18:04 |
| Argos | | Record Argos ID | |
| Light | | | |
| 1m chain with swivel | | | |
| RCM11 | 306 ✓ | lost bolts in frame - was loose | 18:05 |
| SBE 37 MicroCAT | 3228 ✓ | very lightly fussy | 18:05 |
| SBE 37 MicroCAT | 5243 ✓ | | 18:19 |
| 2 x 17" glass | | | 18:21 |
| RCM11 | 445 ✓ | | 18:21 |
| SBE 37 MicroCAT | 3906 ✓ | bent dust plug - flooded | 18:26 |
| SBE 37 MicroCAT | 5244 ✓ | | 18:33 |
| 2 x 17" glass | | | 18:35 |
| RCM11 | 448 ✓ | | 18:35 |
| SBE 37 MicroCAT | 3230 ✓ | | 18:40 |
| SBE 37 MicroCAT | 6113 ✓ | | 18:45 |
| 10 x 17" glass | | tangle - black + white | 18:48 |
| Swivel | | | |
| RCM11 | 449 ✓ | | 18:48 |
| SBE 37 MicroCAT | 3231 ✓ | | 18:57 |
| SBE 37 MicroCAT | 6114 ✓ | | |
| SONTEK ARGONAUT | D295 ✓ | Rusty - discolored head | 19:02 |
| 5 x 17" glass | | | 19:09 |
| SBE 37 MicroCAT | 3232 ✓ | | 19:10 |

| | | | |
|-----------------|--------|--|-------|
| SBE 37 MicroCAT | 5247 ✓ | missing clamp  ^{slid down to join} | 19:16 |
| RCM11 | 450 ✓ | | 19:19 |
| 5 x 17" glass | | | 19:27 |
| SBE 37 MicroCAT | 3233 ✓ | | 19:29 |
| SBE 37 MicroCAT | 6112 ✓ | missing clamp  - slid down to join | 19:41 |
| 2 x 17" glass | ← | | 19:47 |
| RCM11 | 451 ✓ | ↓ changing drum tangles above glass. | 19:48 |
| 5 x 17" glass | | | |
| SBE 37 MicroCAT | 3244 ✓ | | 20:07 |
| SBE 37 MicroCAT | 3907 ✓ | | 20:24 |
| 11 x 17" glass | | tangled in itself | |
| Swivel | | | |
| Release #1 | | | |
| Release #2 | | | 20:26 |

Ascent rate ?
Time at end of recovery 20:26

position is } blocked by bathy?
NW of site }

Ranging

| Time | Range 1 | Range 2 | Command /comment |
|----------|---------|----------|----------------------------|
| 16:38:38 | — | — | |
| 16:39:20 | — | — | |
| 16:39:57 | — | — | |
| 16:40:56 | — | — | |
| 16:41:38 | — | — | |
| 16:42:26 | — | — | |
| 16:43:03 | — | 10829.6 | V -12.7 |
| 16:44:01 | — | 12881.7 | — |
| 16:51:10 | — | 3882.2 m | V -12.7 |
| 16:51:46 | 3882.9 | 3884.7 | V 8.6 |
| 16:52:45 | 3886.5 | — | ARM + REL |
| 16:53:22 | — | — | |
| 16:54:10 | — | 3726.8 | REL OK |
| 16:54:22 | — | — | |
| | | | Bridge called - on surface |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

PROBLEMS AT START OF RANGING LIKELY CAUSED BY X-DUCK
HUGGING THE SHIP IN THE STRONG SURFACE CURRENT.
(GOOD) RANGES ONCE SHIP DRIFTING WITH CURRENT.

WB2 2010/03
AS DEPLOYED
OCEANUS
2010

SBE 50M

RCM11 100M

SBE 100M

BUOY 175M

RCM11 175M

SBE 175M

SBE 325M

RCM11 400M

SBE 500M

SBE 700M

RCM11 800M

SBE 900M

SBE 1100M

RCM11 1200M

SBE 1300M

SONTEK + SBE 1500M

SBE 1700M

SBE 1900M

RCM11 2050M

SBE 2300M

SBE 2800M

RCM11 3000M

SBE 3300M

SBE 3850M

WATER DEPTH
3890M

3223 JOIN

305 JOIN

5239 JOIN

306 JOIN

3228 JOIN

5243

445 JOIN

3906

5244

448 JOIN

3230

6113

449 JOIN

3231

D295 + 6114

3232 JOIN

5247

450 JOIN

3233 JOIN

6112

451 JOIN

3244 JOIN

3907 JOIN ABOVE GLASS

AR861 SN 910
AR861 SN 256

35M NYLON 16MM
10M 1/2" CHAIN

ANCHOR CHAIN 2200 KG

RECOVERY LINE
TRYMSYN FLOATS

50M 4MM WIRE

30" SYNTACTIC ARGOS SN Y01-030
ID 46503 LIGHT SN Y01-049
1M CHAIN SWIVEL

75M 4MM WIRE

51" SYNTACTIC ARGOS SN 286
ID 22442 LIGHT SN Y01-050
1M CHAIN AND SWIVEL

200M 3/16" WIRE

2 GLASS SPHERES
400M

425M 3/16" WIRE

2 GLASS SPHERES
800M

400M 3/16" WIRE

10 SPHERES
1200M
SWIVEL

500M 1/4" WIRE

5 GLASS SPHERES
1700M
SWIVEL

300M 1/4" WIRE

5 GLASS SPHERES
2300M
SWIVEL

690M 1/4" WIRE

2 GLASS SPHERES
3000M

310M 1/4" WIRE

5 SPHERES
3300M

435M 1/4" WIRE

40+10+20M
1/4" WIRE

11 GLASS SPHERES
3755M
SWIVEL

NMFD/RAPID

VHF ch. 72

156.625

mismatch

RAPID-WATCH MOORING LOGSHEET RECOVERY

Mooring **WB4L5** Cruise **KN200-4**

NB: all times recorded in GMT

Date 24 Apr 2011

Site arrival time

~~early predawn~~
~~mid-morning~~

Time of first ranging 10:06

Time of release 10:07

11:13 on surface
Starboard stern

Latitude _____ Longitude _____

(record positions at time of pickup only if likely to be very different from deployment position)

→ 0.3 nm
setup dist is not
enough.

| ITEM | SER NO | COMMENT | TIME |
|-----------------------------------|--------------------|--|-------|
| 17" glass | | yellow | 11:39 |
| Recovery line | | | |
| Billings Float with VHF and Light | X02-052 W03-013 | yellow, antenna intact tangles - chain & line | 11:45 |
| 2 x 17" glass | | orange | 11:45 |
| 15m polyprop | | very twisted | |
| 3 x 17" glass | | orange | 11:49 |
| 15m polyprop | | | |
| BPR #1 in tripod | 0033 | | 11:54 |
| Release #1 in tripod | | | |

doing
I think
1/2 kt

Ascent rate _____
Time at end of recovery _____

Ranging

| Time | Range 1 | Range 2 | Command /comment |
|----------|---------|---------|------------------|
| 10:06 | — | 4668 | |
| 10:06:48 | 4668 | 4668 | |
| 10:07:32 | 4667 | 4666 | ARM + REL OK |
| 10:08:30 | 4613 | 4603 | |
| 10:09:30 | 4540 | 4530 | |
| 10:10:30 | 4471 | 4461 | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

NEED TO RECORD FREQUENCIES

on radio
401.656 MHz

couldnt hear VHF on bridge

67 min
70 / 4700
estimate surface @ 11:13
~ 0713

70 m/min

RAPID-WATCH MOORING LOGSHEET

DEPLOYMENT

Mooring **WB4L7**

Cruise **KN200-4**

NB: all times recorded in GMT

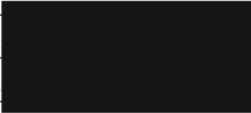

Date _____

Site arrival time 21:35 ~

Start time 21:53

End time _____

*needed to
move glass
to setup*

| ITEM | SER NO | COMMENT | TIME |
|--------------------------------|--------|---|----------|
| 12" glass pick up float | | ORANGE | 21:53 |
| 15m polyprop | | | |
| Billings Float with beacons | | YELLOW | |
| Argos Beacon ID <u>53130</u> ← | | Record PTT number <u>51A 702-055</u> | |
| Light | | Z 02-019 | |
| 5m of 1/2" chain | | | |
| 15m of polyprop | | | |
| 4 x 17" glass | | ORANGE | 21:54 |
| 15m polyprop | | | |
| 4 x 17" glass | | ORANGE | 21:55 |
| 15m polyprop | | | |
| 4 x 17" glass | | ORANGE | 21:55 |
| 15m polyprop | | | |
| BPR #1 in tripod | 0014 | | |
| BPR #2 in tripod | 0057 | | |
| Release #1 in tripod | 1349 | Record release c  | |
| Release #2 in tripod | 358 | Record release c  | |
| Anchor 500 KG | | | 21:56:50 |

Argos beacon #1 ID (PTT) _____
 Release #1 arm code _____
 Release #1 release code _____
 Release #2 arm code _____
 Release #2 release code _____
 Anchor Drop Position _____
 Latitude 26° 29.198' N
 Uncorrected water depth _____
 Corrected water depth _____

53130


Longitude 75° 48.435' W
 _____ (at anchor launch)
 _____ (at anchor launch)

@ 21:58:38
 26° 29.1996'
 75° 48.4311'

4717 m
 using m beam
 w/ 1534.9 m/s
 corrected at

RAPID-WATCH MOORING LOGSHEET

DEPLOYMENT

NOTE: TOOK 1:45 to build the first 4 strings of 5 rugby floats

Mooring **WB4** Cruise **KN200-4**
 NB: all times recorded in GMT
 Date 24 Apr 2011 Site arrival time ~1315
 Setup distance 5nm
 Start time 16:55 End time _____
 Start Position _____
 Latitude _____ Longitude _____

| ITEM | SER NO | COMMENT | TIME |
|---------------------------------|--------|--|-------|
| 1 x Trimsyn pickup float | | YELLOW | 16:55 |
| 3 TRIMSYN floats | | | |
| SBE37 Microcat | 4464 ✓ | | |
| 32" syntactic buoy with beacons | | ORANGE | 16:59 |
| ARGOS LIGHT } check Rob's | | Record beacon ID | |
| 1m Chain and swivel | | | |
| NORTEK in frame | 5490 ✓ | | 16:59 |
| SBE37 Microcat | 3483 ✓ | (5m down from Nortek) | 17:03 |
| 49" syntactic buoy with beacons | | ORANGE | 17:13 |
| ARGOS LIGHT } check Rob's | | Record beacon ID | |
| 1m chain and swivel | | | |
| SBE37 Microcat | 3486 ✓ | ~10m below float | 17:16 |
| NORTEK in frame | 5590 ✓ | | 17:24 |
| SBE37 Microcat | 4714 ✓ | (5m down from Nortek) | 17:28 |
| SBE37 Microcat | 3248 ✓ | | 17:33 |
| NORTEK in frame | 5611 ✓ | | 17:41 |
| SBE37 Microcat | 3249 ✓ | (5m down from Nortek) | 17:42 |
| SBE37 Microcat | 3251 ✓ | | 17:47 |
| 10x 2000m rated rugby floats | | | 18:02 |
| NORTEK in frame | 5955 ✓ | | 18:02 |
| SBE37 Microcat | 3252 ✓ | (5m down from Nortek) | |
| NORTEK in frame | 6049 | 4.5 BETWEEN FLOATS + WATER DEPLOYED BETWEEN FLOATS | 18:18 |
| 5x 5000m rated rugby floats | | | 18:18 |
| SBE37 Microcat | 3253 ✓ | (5m down from floats) | 18:21 |
| 5x 5000m rated rugby floats | | | 18:35 |
| NORTEK in frame | 6050 | COULDN'T AND ROTATED JUST BEFORE PAYING OUT. | 18:35 |
| SBE37 Microcat | 5788 | (5m down from Nortek) | 18:37 |
| 5x 5000m rated rugby floats | | | 18:52 |
| SBE37 Microcat | 3259 | (5m down from floats) | 18:53 |
| 5x 5000m rated rugby floats | | | 19:07 |
| NORTEK in frame | 6088 | | 19:07 |

INCREASE SPEED TO 1KT →

4.6nm

4.1nm

| | | | | |
|---|------|---------------------------------|----------|-------------|
| SBE37 Microcat | 3484 | (5m down from Nortek) | 19:10 | |
| 5x 5000m rated rugby floats | | | 19:24 | |
| SBE37 Microcat | 3268 | (5m down from floats) | 19:26 | 3.6nm |
| 5x 5000m rated rugby floats | | | 19:41 | 1-1.5kt |
| NORTEK in frame | 6516 | | 19:41 | over ground |
| SBE37 Microcat | 5238 | (5m down from Nortek) | 19:42 | |
| SBE37 Microcat at join of 500m and 70m | 3207 | above @ the join | 19:59 | |
| NORTEK in frame between 50m and 25m lengths | 6534 | | 20:07 | |
| 10x Benthos glass | | | 20:15 | |
| Swivel | | | | |
| Acoustic release #1 | 825 | Record release codes [redacted] | 20:15 | |
| Acoustic release #2 | 1346 | Record release codes [redacted] | | |
| 20m nylon | | | 20:16 | ready at |
| 10m 1/2" chain | | Towed for 2.8 nm | 23:40 | 3:21 |
| Anchor 2700 KG | | | 23:43:04 | from start |

Release #1 arm code [redacted]
 Release #1 release code [redacted]
 Release #2 arm code [redacted]
 Release #2 release code [redacted]
 Argos beacon #1 ID } see Rob's } 53157
 Argos beacon #2 ID } spheres } 53129
 built, couldn't read

0.3 nm fallback
 ~ 15 min for 1.2 nm over ground

Anchor Drop Position
 Latitude 26° 29.323 Longitude 75° 48.418 Target was 26° 29.2' N
 75° 48.71' W
 Uncorrected water depth 4708 (at anchor launch) looking for early drop
 Corrected water depth 4745 (at anchor launch) site with ~~4730~~
 4730m
 corrected water depth

Going 0.3 nm past site
 of 26° 29.2' 75° 48.71
 w/ water depth 4704m uncorrected

Note - remove 10m of wire so design is for 4705m but due to expected wire meas error, post 2 top micat were at 25m instead of 50m. ∴ 4705 + 25 = 4730m desired corrected water depth.

23:55:00



2477

2497

23:56:00

2674

2691

23:57:00

2870

2889

00:02:17

3859

3880

sn 1346

00:05:29

4433.

4454

00:06:28

4575

4599

00:07:33

4645

—

00:08:30

—

—

00:09:25

4646.

①

WB4L

③

WB4*

②

WB4L WB4L

0921 0924

| s/n | ARM | time | range | range | diag | lat | lon |
|------|-----|----------|--------|--------|------------|-------------|-------------|
| 0924 | | 00:36:25 | 5106.8 | 5217.5 | | 26° 30.012' | 75° 49.456' |
| 0921 | | 00:36:50 | 5110.3 | 5220.4 | North site | | |
| | | 00:37:14 | 5113.6 | 5223.2 | | | |
| | | 00:55:25 | 5059.4 | 5008.5 | | 26° 28.489' | 75° 49.522' |
| | | 00:55:52 | 5062.5 | 5011.0 | | | |
| | | 00:56:15 | 5064.3 | 5014.4 | | | |
| | | 01:16:55 | 4838.7 | 4906.5 | | 26° 29.209' | 73° 47.760' |
| | | 01:17:20 | 4836.3 | 4899.7 | | | |
| | | 01:17:46 | 4834.2 | 4897.3 | | | |

WB4L

WB4

②

WB4
TO DEPLOY
KNORR 2011

RECOVERY LINE
TRYMSYN FLOATS

| | | | |
|-----------|-------------|---|---|
| SBE 50M | JOIN 4464 | 40M 4MM WIRE | |
| BUOY 90M | | 32" SYNTACTIC ARGOS SN ID LIGHT | |
| CM100M | JOIN ✓ 5490 | | ← Chain + swivel |
| SBE 100M | JOIN 3483 | 10M 5MM WIRE - REMOVED | |
| | | 140M 3/16" WIRE | |
| BUOY 250M | | 49" SYNTACTIC ARGOS SN ID LIGHT | |
| | | 1M CHAIN AND SWIVEL | |
| SBE 250M | JOIN 3486 | 160M 1/4" WIRE | |
| CM 400M | JOIN 5590 | | |
| SBE 400M | JOIN 4714 | 400M 1/4" WIRE | |
| SBE 600M | 3248 | | |
| CM 800M | JOIN 5611 | | |
| SBE 800M | JOIN 3249 | 380 - shown B/E 383M 1/4" WIRE RUNNER | |
| SBE 1000M | 3251 | | |
| CM 1200M | JOIN 5955 | | |
| SBE 1200M | JOIN 3252 | 392-5 393M 1/4" WIRE | |
| CM 1500M | JOIN 6049 | → WAS A MISTAKE SV, NOT DEPLOYED LIKE AS IN FRAME | |
| | | | 10 OFF CLAMP ON FLOATS 2000M RATED 7M WIRE 10M SWIVEL |
| SBE 1600M | JOIN 3253 | 392-5 393M 1/4" WIRE | |

5229

WB4
TO DEPLOY
KNORR 2011

SWIVEL
PAGE 2 OF 2

SBE 2000M

JOIN 6050 ✓ ⁴⁹⁵
496M 1/4" WIRE

SBE 2500M

JOIN 3259 ✓ ⁴⁹⁵
496M 1/4" WIRE

CM 3000M

JOIN 6088 ✓

SWIVEL

SBE 3000M

JOIN 3484 ✓ ⁴⁹⁵
496M 1/4" WIRE

SBE 3500M

JOIN 3268 ⁴⁹⁵
496M 1/4" WIRE

SWIVEL

CM 4000M

JOIN 6516 ✓

SBE 4000M

JOIN 5238 ✓
500M 1/4" WIRE

SBE 4500M

JOIN 3207
70M 1/4" WIRE

CM 4600M

JOIN 6534
50M 1/4" WIRE
25M 1/4" WIRE

S-L-S BETWEEN ALL
FLAT-NONSLIP JOINTS
AS MUCH AS ABOVE FLOATS
+ BELOW NONTKIC



10 BENTHOS
4650M
SWIVEL AT TOP

825 [REDACTED]
AR861 SN ARM REL
AR861 SN ARM REL

1346 [REDACTED]

20M NYLON UNDER RELEASES

10M 1/2" CHAIN

ANCHOR CHAIN 2700 KG

WATER DEPTH
4713M



NMFD/RAPID

RAPID-WATCH MOORING LOGSHEET

RECOVERY

Mooring **WB4**Cruise **KN200-4**

NB: all times recorded in GMT

Date

23/4/11

Site arrival time

15:02

Time of first ranging

15:04

Time of release

15:15

spotted 15:19

top 2000m up log 15:50

Latitude _____

Longitude _____

(record positions at time of pickup only if likely to be very different from deployment position)

15:19 SPOTTED



















| ITEM | SER NO | COMMENT | TIME |
|------------------------------|------------|--|-------|
| Recovery line | | TOWING MONITOR STRAINS TO WIND/Traffic | 16:03 |
| 3 TRYMSYN floats | | SAME MOUNTING 16:53 | 16:57 |
| SBE37 Microcat | 3206 ✓ | in BELOW FLOATS - LIGHT MISSING | 16:57 |
| 32" syntactic buoy | | | 17:06 |
| ARGOS | | | ↓ |
| LIGHT | | | |
| 1m Chain and swivel | | | |
| NORTEK | 5879 ✓ | | ↓ |
| SBE37 Microcat | 3215 | 4m down from NORTEK | 17:09 |
| 49" syntactic buoy | | KINK IN WIRE JUST ABOVE BUOY | 17:19 |
| ARGOS | | NEED TO DISCONNECT BLOW FROM CABLE TO | ↓ |
| LIGHT | | MOVE OUT THE WAY THEN REATTACH IN | |
| 1m chain and swivel | | LINE TO CONTINUE RECOVERY. | ↓ |
| SBE37 Microcat | 6819 ✓ | | 17:30 |
| NORTEK | 5884 ✓ | fish bite above join - PHOTOS | 17:35 |
| SBE37 Microcat | 3219 ✓ | | 17:38 |
| SBE37 Microcat | 3221 ✓ | | 17:44 |
| NORTEK | 5889 ✓ | | 17:49 |
| SBE37 Microcat | 3222 ✓ | 6m from norstek | 17:51 |
| SBE37 Microcat | 3224 ✓ | | 17:55 |
| 10x 2000m rated rugby floats | | | 18:02 |
| NORTEK | 5890 ✓ | | 18:12 |
| SBE37 Microcat | 3225 ✓ | 4m down | 18:16 |
| NORTEK | 6765! | nortek after floats @ join | |
| 5x 5000m rated rugby floats | | | 18:26 |
| SBE37 Microcat | 3234 ✓ | 6m after nortek | 18:30 |
| 5x 5000m rated rugby floats | | | 18:41 |
| NORTEK | 5897 5967! | | 18:42 |
| SBE37 Microcat | 3913 ✓ | 25m after nortek | |
| 5x 5000m rated rugby floats | | CHANGING DRUMS | 18:58 |
| SBE37 Microcat | 6798 | | 19:10 |

anchor seabed
26° 21.77'
75° 44.27'

halfway

WB4 2010/26
TO RECOVER
KNORR 2010

RECOVERY LINE
TRYMSYN FLOATS

| | | | |
|---|---|----------------------------|---|
| SBE 50M |  | 3206 JOIN ✓ | 40M 4MM WIRE |
| BUOY 90M |  | | 32" SYNTACTIC ARGOS SN304 ID 82895 LIGHT X01-051 |
| NORTEK 100M |  | 5879 JOIN ✓ | |
| SBE 100M |  | 3215 JOIN ✓ | |
| | | | 10M 5MM WIRE |
| | | | 140M 3/16" WIRE |
| BUOY 250M |  | | 49" SYNTACTIC LIGHT X01-052 1M CHAIN AND SWIVEL |
| SBE 250M |  | 6819 JOIN | 160M 1/4" WIRE |
| NORTEK 400M |  | 5884 JOIN | |
| SBE 400M |  | 3219 JOIN | 400M 1/4" WIRE |
| SBE 600M |  | 3221 | |
| NORTEK 800M |  | 5889 JOIN | |
| SBE 800M |  | 3222 JOIN | 383M 1/4" WIRE |
| SBE 950M |  | 3224 | |
| NORTEK 1200M |  | 5890 JOIN | |
| SBE 1200M |  | 3225 JOIN | 393M 1/4" WIRE |
| <i>Nortek 6765 @ join</i> → SBE 1600M |  | 3234 JOIN | 393M 1/4" WIRE |
| NORTEK 2000M |  | 5897 JOIN 5967! | |
| SBE 2000M |  | 3913 JOIN | 496M 1/4" WIRE |
| SBE 2500M |  | 6798 JOIN | 496M 1/4" WIRE |

Check why HAVE THIS 10m LENGTH

SP57150 15:19


SURFACES
15:22
10 OFF
CLAMP ON
FLOATS
2000M
RATED
7M WIRE
SWIVEL


SURFACES
15:35

SWIVEL
15:48

3000M


NMFD/RAPID


NORTEK 3000M  ~~5967 JOIN~~ *5897* ✓ SWIVEL


SBE 3000M  6799 JOIN ✓ 496M 1/4" WIRE


SBE 3500M  6800 JOIN ✓ ✓

496M 1/4" WIRE ✓

NORTEK 4000M  6119 JOIN ✓ SWIVEL

SBE 4000M  6801 JOIN ✓ 500M 1/4" WIRE

SBE 4500M  6802 JOIN 70M 1/4" WIRE

NORTEK 4620M  *6132*
~~6765 JOIN~~ 25M 1/4" WIRE

10 BENTHOS
 4650M
 SWIVEL AT TOP



1 GLASS IMPLoded

AR861 SN 1242 ARM 
 AR861 SN 1200 ARM 

20M NYLON UNDER RELEASES

10M 1/2" CHAIN

ANCHOR CHAIN 2700 KG

WATER DEPTH
 4713M CORR.



RAPID-WATCH MOORING LOGSHEET

DEPLOYMENT

Mooring **WB6**

Cruise **KN200-4**





NB: all times recorded in GMT

Date 21/Apr/2011 Site arrival time 01:00 approx
 Setup distance 0.5 nm - rough / 1st count
 Start time 01:37 End time 01:56
 Start Position
 Latitude 26° 29.65 Longitude -70° 31.4

| ITEM | SER NO | COMMENT | TIME |
|--|--------|-------------------------------|-------|
| 12" glass pick up float | | ORANGE | 01:44 |
| 15m polyprop | | | |
| Billings float with beacons | | YELLOW | |
| Argos beacon | | Record PTT - TUBE OVER AERIAL | 01:44 |
| Light | | | |
| 5m chain | | | |
| 15m polyprop | | | |
| 2 x 17" glass | | ORANGE | 01:45 |
| MicroCAT below join | 3209 | | 01:45 |
| 100m polyester | | | |
| MicroCAT at halfway | 6840 | | 01:48 |
| 100m polyester | | | |
| 2 x 17" glass | | ORANGE | 01:50 |
| MicroCAT below join | 6820 | | 01:50 |
| 100m polyester | | | |
| MicroCAT at halfway | 6821 | | |
| Sontek Argonaut as halfway RCM11 | 515 | | |
| 100m polyester | | | |
| MicroCAT above join | 6822 | 2m UP FROM JOIN | 01:54 |
| 8 x 17" glass | | ORANGE | |
| BPR #1 on tripod | 0039 | | |
| BPR #2 on tripod | 0033 | | |
| Release #1 in tripod | 498 | Record release codes | |
| Release #2 in tripod | 324 | Record release codes | |
| Anchor 600 KG | | | 01:56 |

3/10 nm
halfway

+60m
5534 aban
5564 in
echo sounder

Argos beacon #1 ID (PTT) 53128
 Release #1 arm code 
 Release #1 release code 
 Release #2 arm code 
 Release #2 release code 

Anchor Drop Position
 Latitude 26° 29.58' Longitude 70° 31.53 200m off

Uncorrected water depth 5535 m/s 5440 (at anchor launch)
 Corrected water depth 5500 (at anchor launch)

RAPID-WATCH MOORING LOGSHEET

RECOVERY

0

Mooring **WB6**

Cruise **KN200-4**

NB: all times recorded in GMT

Date 20/4/11

Site arrival time 16:57

Time of first ranging 17:00

Time of release 17:03

1809 surface

Latitude _____ Longitude _____

(record positions at time of pickup only if likely to be very different from 18 28 hook deployment position)

| ITEM | SER NO | COMMENT | TIME |
|--------------------------|----------------|------------------------------|-------|
| Pick Up float | | | 18:28 |
| 15m polyprop | | landtec winch is short | |
| 3 x 17" glass | | (switch to old barrel 18:51) | 18:46 |
| Microcat at join | 3207 ✓ | | 18:51 |
| 100m polyester | | 1852- | |
| Microcat about halfway | 5238 ✓ | | 18:56 |
| 100m polyester | | | |
| 2 x 17" glass | | exploded | 19:00 |
| Microcat at join | 3212 ✓ | | 19:02 |
| SONTEK ARGONAUT | D273 + 3213 ✓ | | 19:06 |
| 100m polyester | | (twisted rope) | |
| Microcat about halfway ? | | | |
| 100m polyester | | | |
| Microcat at join | 3214 ✓ | | 19:11 |
| 8 x 17" glass | | | 19:12 |
| BPR #1 on tripod | 418 ✓ | | 19:15 |
| BPR #2 on tripod | 0232 ✓ | | |
| Release #1 in tripod | 361 ✓ | | |
| Release #2 in tripod | 623 | | |

Ascent rate 92 m/min

Time at end of recovery 19:15 clean up deck + secure till 19:27

Ranging

| Time | Range 1 | Range 2 | Command /comment |
|----------|---------|---------|-----------------------|
| 17:00:14 | ✓ | ✓ | SN 361 ARM + ARM |
| | 5563 | 5563 | |
| 17:01:45 | ✓ | ✓ | SN 827 ARM + ARM |
| 17:03:05 | 5560 | 5560 | 361 ARM + REL REL OK. |
| 17:04:00 | 5500 | ✓ | |
| 17:05:00 | 5408 | 5393 | |

92m/min

RAPID-WATCH MOORING LOGSHEET

DEPLOYMENT

Mooring **WBADCP**

Cruise **KN200-4**

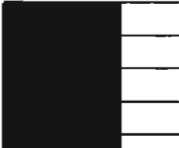
NB: all times recorded in GMT

Date 30 Apr 2011
 Start time 16:24

Site arrival time 15:20
 End time 16:32

| ITEM | SER NO | COMMENT | TIME |
|----------------------------|--------|-------------------|----------|
| 1 x 12" glass pickup float | | | 16:24 |
| 15m polyprop | | | |
| Syntactic ADCP buoy | | 2 anodes replaced | 16:25 |
| 75 KHZ ADCP | 10311 | | |
| ARGOS BEACON +Light | | Record PTT | |
| Titanium swivel | | | |
| 10m 5/8" chain | | | |
| Acoustic Release #1 | 1351 | | |
| Acoustic Release #2 | 1353 | | |
| 5m 5/8" chain | | | |
| Anchor 850 KG | | | 16:32:20 |

Argos beacon #1 ID
 Release #1 arm code
 Release #1 release code
 Release #2 arm code
 Release #2 release code

46508 ← from Rob


Anchor Drop Position
 Latitude 26°31.4968
 Uncorrected water depth
 Corrected water depth

Longitude 76°52.0800
608m (at anchor launch)
617 (at anchor launch)

RAPID-WATCH MOORING LOGSHEET

DEPLOYMENT

Mooring **WBAL2**

Cruise **KN200-4**

NB: all times recorded in GMT

Date 30 Apr 2011

Site arrival time 17:16

Start time 17:17

End time _____

| ITEM | SER NO | COMMENT | TIME |
|-----------------------------|---------|------------------------------------|----------|
| 12 " glass pick up float | | | 17:18 |
| 15m polyprop | | | |
| Billings Float with beacons | | | 17:18 |
| Argos Beacon | Y01-012 | Record PTT number 76494 | |
| Light | Y01-016 | | |
| 5m of 1/2" chain | | | |
| 15m of polyprop | | | |
| 4 x 17" glass | | | 17:19 |
| 15m polyprop | | | |
| 4 x 17" glass | | | 17:19 |
| 15m polyprop | | | |
| 4 x 17" glass | | | 17:20 |
| 15m polyprop | | | |
| BPR #1 in tripod | 417 | not tied above | |
| BPR #2 in tripod | 39 | | |
| Release #1 in tripod | 1352 | Record release codes | |
| Release #2 in tripod | 364 | Record release codes | |
| Anchor 500 KG | | | 17:21:20 |
| | | | |

Argos beacon #1 ID (PTT)

46494

Release #1 arm code



Release #1 release code



Release #2 arm code



Release #2 release code



Anchor Drop Position

Latitude 26° 31' 57.4" N

Longitude 76° 52' 55.2" W

Uncorrected water depth

493 (at anchor launch)

Corrected water depth

501 (at anchor launch)

RAPID-WATCH MOORING LOGSHEET

DEPLOYMENT

Mooring **WBH2**

Cruise

KN200-4

NB: all times recorded in GMT

Date 27 Apr 2011

Site arrival time ~7am GMT (overnight)

Setup distance 5nm due to 0.8 kts current against us, May mean ~~more~~ ^{less} fallback.

Start Position

Latitude 26° 32.937'

Longitude 76° 41.039'

Start time 12:22

End time 14:36

low tension
doing 1.8 kt
thru water
= 2.5 kt original

2.88 nm to
target

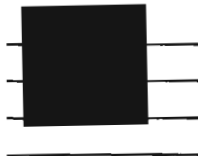
1.5 nm
10:37 to
drop
(800m past)

| ITEM | SER NO | COMMENT | TIME |
|-----------------------------|---------|---|------------------|
| 1 x 12" glass pickup | | YELLOW | 12:23 |
| Recovery line | | | |
| Billings float with beacons | | YELLOW | 12:24 |
| ARGOS beacon | X02-051 | Record PTT 93792/9AE7A00 | |
| Light | X01-051 | | |
| 5m chain | | | |
| 14 x 17" glass | | ORANGE | 12:57 |
| Swivel | | | |
| NORTEK | 6723 | up/down looking? | 12:57 |
| 7 x 17" glass | | ORANGE | 12:57 |
| NORTEK | 6083 | up/down looking? | 12:57 |
| NORTEK | 6805 | up/down looking? | 13:12 |
| 3 x 17" glass | | ORANGE | 13:32 |
| Swivel | | | |
| NORTEK | 8052 | Up/down looking? | 13:33 |
| SBE37 Microcat | 3214 | (5m down from Nortek) | 13:34 |
| SBE37 Microcat at join | 3213 | | 13:48 |
| 3 x 17" glass | | ORANGE | 13:57 |
| NORTEK | 8120 | Up/down looking? beam not quite away from bay | 13:58 |
| SBE37 Microcat | 3212 | ~5m | 14:06 |
| 5 x 17" glass | | (5m above glass) | 14:08 |
| Swivel | | | |
| Release #1 | 1348 | Record release codes } Sec Rob's | 14:09 |
| Release #2 | 1350 | Record release codes } | 14:09 |
| 20m Nylon | | down to anchor only @ | 14:20 |
| 5m 1/2" chain | | | |
| Anchor 1400kg | | | 14:36:07 |



@ 14:22
ETA
06 am
15 min

Release #1 arm code
Release #1 release code
Release #2 arm code
Release #2 release code
Anchor Drop Position



26° 28.775

76° 37.163

Latitude _____
 Uncorrected water depth _____
 Corrected water depth _____

Longitude _____
4698 (at anchor launch)
 _____ (at anchor launch)

FROM Anchor seabed - looks to be in 4780m deep.

Descent -

| | | <u>r1</u> | <u>r2</u> | |
|------|---------------------|-----------|-----------------|-------------|
| 0923 | 14 42:23 | - | 1271.2m | |
| | 14:42:56 | 1323.6 | 1342.1m | } 184 m/min |
| | 14:43:56 | 1507.7 | 1527.1 | |
| 0925 | 14:45:10 | 1731.0 | 1749.5 | } 180 m/min |
| | 14:46:10 | 1911.7 | 1930.8 | |
| | 14:51:50 | 2871 | 3027 | } 156 m/min |
| | 14:51:50 | | | |
| | 14:52:50 | 3027 | | |
| | 14:55:15 | 3369 | 3383 | } 126 m/min |
| | 14:56:15 | 3495 | 3509 | |
| | 14:57:15 | 3619 | 3631 | } 127 m/min |
| | 15:04:30 | 4458 | 4472 | } 113 m/min |
| | 15:05:30 | 4571 | 4585 | |
| | 15:07:30 | 4673 | 4673 | |
| | 15:07:53 | 4673 | 4673 | |

Site 1

SE

site 3

r1

r1

r2

| | | |
|-----------|------------------|-----------------|
| 21:10:50 | 1398. | echo sounder on |
| 21:11:30 | 2413. | 316. |
| 21:15:40 | 4939 | 4940 ← |
| 21:16:05 | 4944.6 | 4946.5 |
| 26°28.288 | 76°36.406 | ← |

| | | |
|-----------------------|--------|--------|
| 22 1130 | 4967.8 | 4966.2 |
| -22 11 53 | 4964.9 | 4964.9 |
| 26° 28.847 76° 38.311 | | |

NE site

| | | | | |
|----------|--------|----------|-----------|-----------|
| 21:49:30 | 5088.4 | 5087.4 ↔ | 26°29.815 | 76°37.385 |
| 21:49:52 | 5085.2 | 5083.7 | | |

RAPID-WATCH MOORING LOGSHEET

RECOVERY

Mooring **WBH2**

Cruise

KN200-4

NB: all times recorded in GMT

Date 26 Apr 2011

Site arrival time 18:01

Time of first ranging 18:02

Time of release 18:05

Setting up 0.5nm from anchor
18:26 - over 1nm
appears to have drifted south

Latitude _____ Longitude _____

(record positions at time of pickup only if likely to be very different from deployment position)

Only waited for top 3
(Bills + 2 x orange) 1854 hooked

| ITEM | SER NO | COMMENT | TIME |
|----------------|-----------|---|-------|
| 1 x 17" glass | | <u>really</u> tangled under 14 glass | |
| Recovery line | | | |
| Billings float | Y01-027 ✓ | REK 46500 | 19:03 |
| Light | Y01-015 ✓ | | |
| 14 x 17" glass | | tangle w/ line below | 19:07 |
| Swivel | | | |
| NORTEK | 6176 ✓ | | 19:09 |
| 7 x 17" glass | | ALL ORANGE - corroded links | 19:28 |
| NORTEK | 6743 ✓ | missing bush? | 19:28 |
| NORTEK | 6747 ✓ | | 19:53 |
| 3 x 17" glass | | ALL ORANGE | 20:14 |
| Swivel | | | |
| NORTEK | 6751 ✓ | tangled line | 20:14 |
| SBE37 Microcat | 3258 ✓ | banged on deck | 20:14 |
| SBE37 Microcat | 5245 ✓ | | 20:29 |
| 3 x 17" glass | | | 20:38 |
| NORTEK | 6753 ✓ | | 20:38 |
| SBE37 Microcat | 3905 ✓ | | 20:46 |
| 5 x 17" glass | | | |
| Swivel | | | |
| Release #1 | 911 | | |
| Release #2 | 249 | | 20:47 |

Ascent rate 80 m/min

Time at end of recovery 20:47

Ranging

| Time | Range 1 | Range 2 | Command /comment |
|----------|---------|---------|------------------|
| 18:02 | 4154 | 3672 | |
| 18:02:57 | 4715.6 | 4715.7 | V 8.7 |
| 18:03:40 | 4714 | | V 12.7 |
| 18:04:24 | 4714.8 | 4714 1 | V 8.4 |

sum
sta
921
249

