



RV Investigator Voyage Plan

VOYAGE #:		IN2026_V03 SOTS	
Version Number:	Final 27.04.2026		
Voyage title:	SOTS: Southern Ocean Time Series automated moorings for climate and carbon cycle studies southwest of Tasmania		
Mobilisation:	Hobart, Monday, 11 May to Wednesday, 13 May 2026		
Depart:	Hobart, 0800 Thursday, 14 May 2026		
Return:	Hobart, 0800 Friday, 29 May 2026		
Demobilisation:	Hobart, Saturday, 30 May 2026		
Voyage Delivery Coordinator:	Susan Carins/Lynn Woodworth	Contact details:	Susan.carins@csiro.au 0488 554 192
Voyage Manager:	Rod Palmer	Contact details:	Rod.palmer@csiro.au
Chief Scientist:	Elizabeth Shadwick		
Affiliation:	CSIRO	Contact details:	elizabeth.shadwick@csiro.au

Scientific objectives

Principal Investigators: Dr. Elizabeth Shadwick (CSIRO) and Dr. Eric Schulz (BoM)

The Southern Ocean has a predominant role in the movement of heat and carbon dioxide into the ocean interior moderating Earth's average surface climate. The IMOS SOTS sub-facility uses a set of two automated moorings to measure these processes under extreme conditions, where they are most intense and have been least studied. The atmosphere-ocean exchanges occur on many timescales, from daily insolation cycles to ocean basin decadal oscillations and thus high frequency observations sustained over many years are required. The current context of anthropogenic forcing of rapid climate change adds urgency to the work.

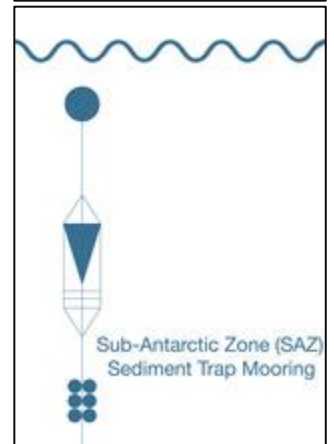
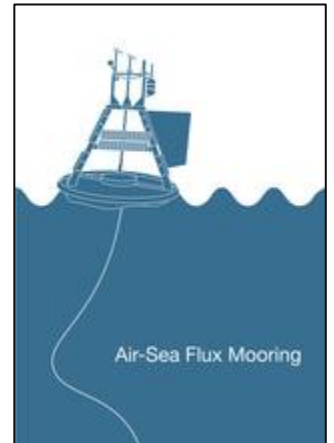
Voyage objectives

The primary objective is to first deploy a new set of SOTS moorings (SOFS-15 and SAZ-28) and then recover the existing SOTS moorings (SAZ-27). Each of the SOTS moorings deliver to specific aspects of the atmosphere-ocean exchanges:

- the SAZ sediment trap mooring collects samples to quantify the transfer of carbon and other nutrients to the ocean interior by sinking particles and investigate their ecological controls.
- the Southern Ocean Flux Station (SOFS) mooring measures meteorological and ocean properties important to air-sea exchanges, ocean stratification, waves, currents and biological productivity and ecosystem structure. Water samples are collected for more detailed nutrient and plankton investigations after recovery.

Ancillary work will obtain supporting information on atmospheric and oceanographic conditions using CTD casts, and underway measurements.

1. Deploy SOFS-15 meteorology/biogeochemistry mooring
2. Deploy SAZ-28 sediment trap mooring
3. Recover SAZ-27 sediment trap mooring
4. CTD sampling (2 cast to 4550m, 2 to 600m) at the SOTS site, including collecting samples for nutrients, oxygen, dissolved inorganic carbon, alkalinity, and eDNA analyses
5. Ship meteorological observations at SOFS buoys for comparisons
6. Deployment of 2 x Argo Floats (1 at the nominal SOTS site, and one closer to Tasmania, in water 2000m deep, on return transit).
7. Underway air and water sampling and sensor measurements, including bio-optics and bioacoustics
8. CPR and Triaxus



Voyage Priorities

Note: The objectives listed above are not the priority ranking, because the list is designed for efficiency, using past voyage experience, to achieve all goals. In particular, deploying SOFS-15 as the first operation frees up deck space and increases efficiency. This sequence also optimises fatigue management (long day, spooling/rest day, short day, short day, long day) but is subject to change based on the weather conditions and other factors including the fatigue of the team.

The overall priority is successful SOTS moorings deployment, recovery, and collection of calibration/validation samples (SOTS objectives 1 – 5), followed by objective 6 and 7. *After these, supplementary and piggyback project operations are prioritised lower, however careful consideration has been applied during planning and will be applied during voyage management at sea, in order to optimise timing of operations for maximum outcomes across all projects.*

Activity plan for first 24-48 hours of voyage

Onboarding

Day 1 – 14th May

- **0700:** Onboarding of science party
- **0800:** Voyage Manager briefing (Aft lounge)
- **0830:** Seagoing induction (Aft lounge)
- **0900:** Muster drill
- **1000:** Departure from PW04
- **1230:** In Adventure or Storm Bay, toolbox talk planning & testing: Moorings (Test fire/training Pneumatic Line Thrower), mooring anchor dual lift, SOFS anchor lift. Begin transit to the SOTS site.
- **1400:** CTD Prestart
- **1500:** Senior Management Meeting (bridge)
- **1600:** Perform Test CTD as soon as seawater is 1000m deep and then deploy CPR to tow down to SOTS

Day 2 – 15th May

- Lab inductions
- SOFS15 Deployment meeting

Piggyback project

Chumbucket: low tech, high return sampling for phytoplankton diversity, Dr Ruth Eriksen (CSIRO)

Understanding and document biodiversity of lower trophic levels (phytoplankton and microzooplankton) in Australian marine waters is dependent on complimentary sampling and analysis methods that combined, provide information on diversity, ecology, toxicology and phenology of both rare and dominant species. The voyages selected for this piggy-back project extend the type and coverage of plankton samples beyond our existing methods and programs (e.g. IMOS SOTS, AusCPR and NRS). By sampling the phytoplankton community using a novel method developed onboard RVI for the SEA-MES voyages ("Chumbucket") we will be able to correlate community composition by microscopy with allied measurements planned as part of multiple voyages (AusCPR, eDNA, underway sensors, remote sensing etc). These measurements will contribute to several observation programs in the region, to enhance our understanding of primary

producers and grazers, and the broader phytoplankton community composition, in the context of rapid environmental change.

Globalising Marine Biodiversity Observations: Autonomous Genomic Sampler Systems, Dr. Sahan Jayasinghe (CSIRO)

Environmental DNA (eDNA) is transforming marine biology by enabling large-scale, cost-effective biodiversity assessments that are far less resource-intensive than traditional survey methods. By analysing eDNA, scientists can gain a more comprehensive understanding of species distribution, abundance, and ecosystem health.

The current project aims to develop and deploy an autonomous eDNA sampling system that can be seamlessly integrated into the RVI's underway seawater system. The onboard Seagoing Instrumentation Team will be supporting the project during the voyage.

Developing Jonathan: An On-vessel Automated Seabird Detector, Carlie Devine, Rich Little (CSIRO)

The objective of this project is to collect seabird counts using an automatic on-vessel seabird edge detector in coastal and open ocean environments.

Planned activities include:

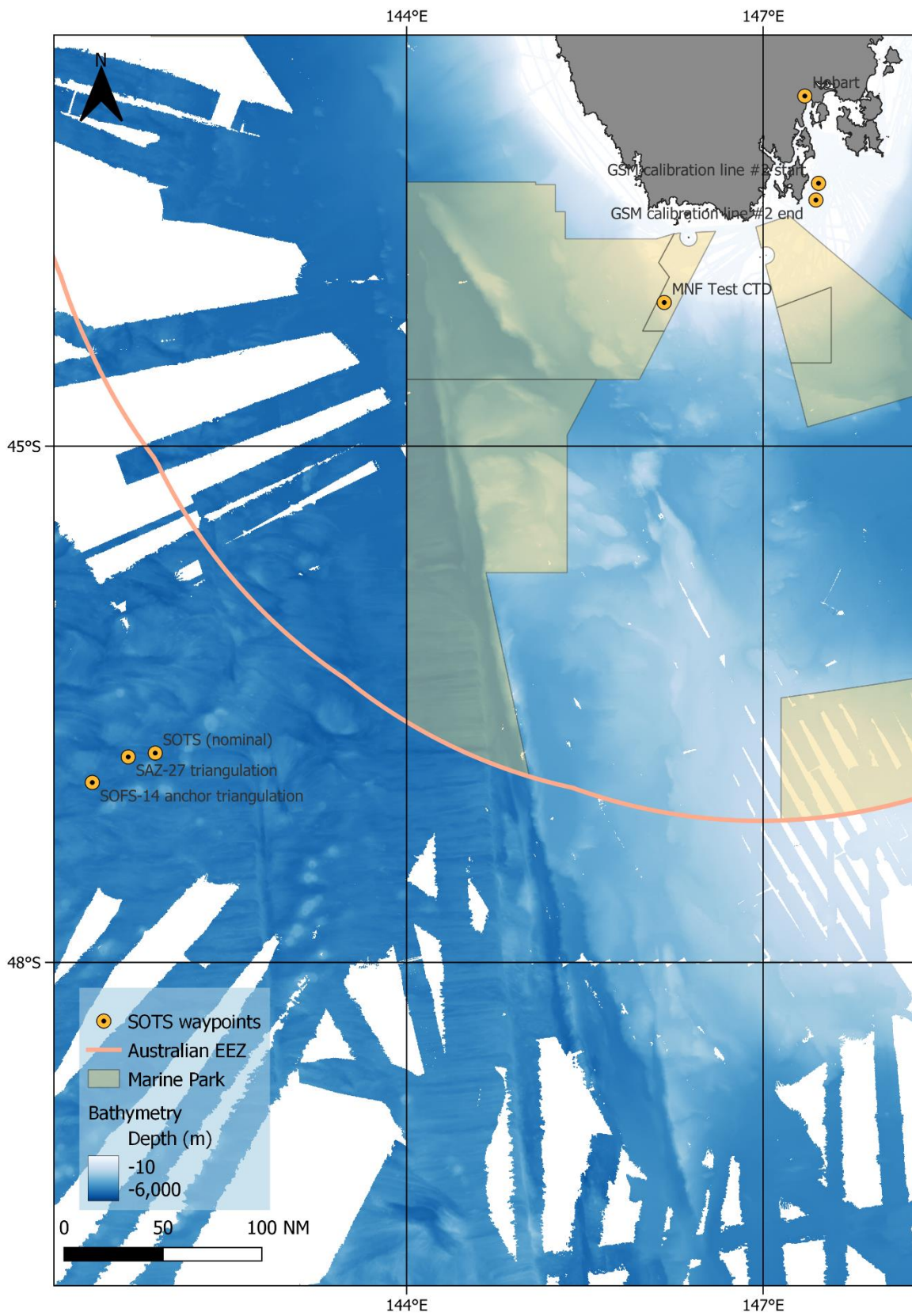
1. Installation of a camera, data storage for video, and processing unit into the RV Investigator electrical system prior to IN2025_V06.
2. During IN2025_V06 the camera, processor will operate while Investigator is underway. The system will be supervised remotely from Hobart with DAP support on the vessel. A daily csv report and mp4 trip files will be saved to system hardware and backed up by DAP, indicating the number of seabirds detected at specific time intervals throughout daylight hours.

The expected outcome of this project is to bring together the hardware and software needed for an on-vessel seabird Edge detector that will provide a running count of seabirds seen by a fixed camera over the course of a day on a sea-going vessel. Successful development of such a system will be the first step in providing more comprehensive and detailed baseline environmental data.

This project has the appropriate CWLLA AEC approval in place.

Requires no berth

Voyage track example



Waypoints and stations

SITE	DEGREES DECIMAL MINUTES LATITUDE	DEGREES DECIMAL MINUTES LONGITUDE	DISTANCE (NM)	TOTAL DISTANCE (NM)	STEAMING TIME (HRS)	TOTAL STEAM (HRS)
Hobart	42° 52.2S/N	147° 21.0E/W				
GSM calibration line #2 start	43° 24.478	147° 27.939	6.22			
GSM calibration line #2 end	43° 30.632	147° 26.618				
MNF Test CTD @ 1,000m (<i>approx waypoints noted here are for a Hobart departure</i>)	44° 8.1	146° 10.02				
SOTS (nominal)	46° 48.200' S	141° 53.040' E	281.9	360.3	28.2	36.5
SOFS-15 (deployment target)	47° 0.2328' S	142° 14.2698' E				
SAZ-28 (deployment) target	46° 47.622'S	141° 48.960'E				
SOFS-14 (anchor) triangulation	46° 58.3782'S	141° 21.2664'E				
SAZ-27 triangulation	46° 49.5330'S	141° 39.4008'E				

Time estimates

DATE	TIME	ACTIVITY
Thu 14	May	1000 – Depart PW04 1230 – In Adventure or Storm Bay, test the following: mooring anchor dual lift, pneumatic line thrower 1230 – Begin transit to SOTS (test CTD when in water >1000 m deep). Towing CPR.
Fri 15	May	Transit; stop for 300m SOTS CTD cast (pre-deployment calibration of SOFS-15 and SAZ-28 sensors) SOFS-15 Deployment Meeting
Sat 16	May	0400: Arrive SOTS-15 deployment site (~19 miles down-weather) 0400-0600: ship drift assessment 0545 SOTS: Toolbox on Bridge for SOFS-15 mooring deployment

OFFICIAL

DATE	TIME	ACTIVITY
		0600-2000 SOTS: Deploy SOFS-15 mooring 2000-2400 SOTS: Triangulate SOFS-15 anchor, collect ship sensor observations close to SOFS-15
Sun 17	May	Rest/Spooling Day 0800-1200: CTD Cast to 4550m (SOTS sampling #1) 1000-1400: Spool on SAZ-28 1400: deploy Argo Float #1 1500-2300: ship sensor observations close to SOFS-15
Mon 18	May	0200-0600: Transit to SAZ-28 deployment start (12 miles down-weather from target) 0645 SOTS: Toolbox on Bridge for SAZ-28 mooring deployment 0730-1600 SOTS: Deploy SAZ-28 mooring 1600-1900 SOTS: Triangulate SAZ-28 anchor location
Tue 19	May	0400-0600 Transit to SOFS-15 site (1 mile down-weather from anchor location) 0800-1400: Daytime ship-buoy comparison at SOFS-15 1400-1800: CTD cast to 4000m (SOTS sampling #2) 1800-2200 SOTS: nighttime ship-buoy comparison at SOFS-15
Wed 20	May	0400-0600 Transit to SAZ-27 recovery site (1 mile down-weather from anchor location) 0645 Toolbox on Bridge for SAZ-27 mooring recovery 0730-1600 Recover SAZ-27 mooring
Thu 21	May	0800-1000: CTD Cast 600 m (post-recovery calibration of SOFS/SAZ sensors) 1200: begin transit to Hobart (towing Triaxus, TBC)
Fri 22	May	Triaxus tow, transit
Sat 23	May	Triaxus tow, transit, deploy Argo float #2 close to Tasmania (depth >2000m)
Sun 24	May	Bad weather allowance
Mon 25	May	Bad weather allowance
Tue 26	May	Bad weather allowance
Wed 27	May	Bad weather allowance
Thu 28	May	
Fri 29	May	Arrive Hobart

CTD Configuration

	PLEASE SELECT:
Fundamentals	
Which CTD rosette to be used for this voyage (24 or 36 Niskin bottles):	36
Likely total number of casts:	4
Likely maximum depth of deepest cast:	X m
Standard CTD Configuration - Instrumentation (maximum 6 auxiliary channels plus 2 x DO) 6000m	
1 x SBE9+ (CTD)	Yes
2 x SBE3P Temperature Sensors	
2 x SBE4C Conductivity Sensors	
2 x SBE5T pumps	
2 x SBE43 Dissolved Oxygen Sensors	Yes
1 x Tritech PA200/500 Altimeter	Yes
1 x Biospherical QCP2300HP PAR Sensor	Yes
1 x Wetlabs C-Star 25cm Transmissometer	No
1 x Wetlabs ECO FLCDRTD Fluorometer – CDOM (370/460nm)	No
1 x Wetlabs ECO FLBBRTD Fluorometer – Chlorophyll-a & Backscatter (2 x channels - 470/695nm)	Yes
Alternative Instruments (Instruments highlighted in grey can be substituted from standard configuration)	
Seapoint Turbidity Meter – Nephelometer	
Chelsea Aquatracka III (430/685nm) Fluorometer – Chlorophyll-a	
Seabird SUNA – Ultraviolet Nitrate Analyzer (Serial Connection - 2000m)	
Standard LADCP Configuration – Instrumentation: 6000m	
1 x Teledyne 300 kHz LADCP (Slave - Up)	Yes
1 x Teledyne 150 kHz LADCP (Master - Down)	
1 x 48V Deep Sea Battery	
Alternative LADCP Configuration - Instrumentation: 6000m	
1 x Teledyne 300 kHz LADCP (Slave - Up)	No
1 x Teledyne 300 kHz LADCP (Master - Down)	
1 x 48V Deep Sea Battery	
Hydrochemistry Analyses	
Salinity	Yes
Dissolved Oxygen	Yes
Nutrients: Nitrate	Yes
Nutrients: Phosphate	Yes
Nutrients: Silicate	Yes

	PLEASE SELECT:
Nutrients: Nitrite	Yes
Nutrients: Ammonia	No

Permits

This voyage expects to transit through the following Marine Parks:

- Tasman Fracture Marine Park
- Huon Marine Park

No operations are planned, except for approved underway science deployments/systems as per the following permits. An assessment of unplanned deployments (e.g. XBTs) is to be carried out onboard before commencing any operations.

- Southeast Marine Parks: PA2020-00041-1 (variation PA2020-00041-7)
- Southeast Marine Parks: PA2020-00041-1 (variation PA2020-00041-14)

Both permits preclude echosounders or other activities that may take, keep, move or interfere with a cetacean. Must act consistently with Part 8 of EPBC Regs 2000 for cetacean and whale watching approach distances and precautionary zones. Must not travel greater than 10 knots when cetaceans are likely to be present.

Other

- AAPP/UTAS permit for import of samples – Permit 0011160332

Personnel List


List all scientific participants, their affiliation and role on the voyage. Please list students as student/role. This table will be removed from the public version of this Voyage Plan (published on the MNF website).

Note: The MNF support staff numbers in this table are indicative and the numbers may increase (or decrease) depending on the activities being undertaken on the voyage and any internal training opportunities that may present.

Seagoing

	NAME	ROLE	ORGANISATION
1.	Rod Palmer	Voyage Manager	CSIRO MNF
	Alan Kemp	SIT Support	CSIRO MNF
	Nicole Morgan	SIT Support	CSIRO MNF
	Jill Brouwer	GSM Support	CSIRO MNF
	Jason Farr	GSM Support	CSIRO MNF
	Kieran Sheehan	DAP Support	CSIRO MNF
	Richard Atkinson	DAP Support	CSIRO MNF
	Charlie Evans	DAP Trainee	CSIRO MNF
	Narendra Pati	Hydrochemistry Support	CSIRO MNF
	Maddy Lahm	Hydrochemistry Support	CSIRO MNF
	Tegan Sime	MNF HSE Observer	CSIRO MNF
	Wayne McKenna	Paramedic	ASPEN MEDICAL
	TBC	IR Cadet	Cyan
	Elizabeth Shadwick	Chief Scientist	CSIRO
	Eric Schulz	Alternate Chief Scientist	BoM
	Haifeng Zhang	Meteorology	BoM
	Corey Hazelwood	Moorings Lead	CSIRO
	Tim Lane	Moorings Support	CSIRO
	Brendan Mather	Field Operations Trainee	CSIRO
	Craig Hanstein	Mooring Electronics	CSIRO
	Esteban Droual	Student/Trainee	UTAS

Signature

Your name	Elizabeth Shadwick
Title	Chief Scientist
Signature	
Date:	13 May 2026

List of additional figures and documents

- a. Appendix AMNF Equipment
- b. Appendix B User Supplied Equipment
- c. Appendix C Hazardous Materials Manifest
- d. SOFS-15 Mooring (for deployment) Diagram
- e. SAZ-28 Mooring (for deployment) Diagram
- f. SAZ-27 Mooring (for recovery) Diagram
- g. Figure 2

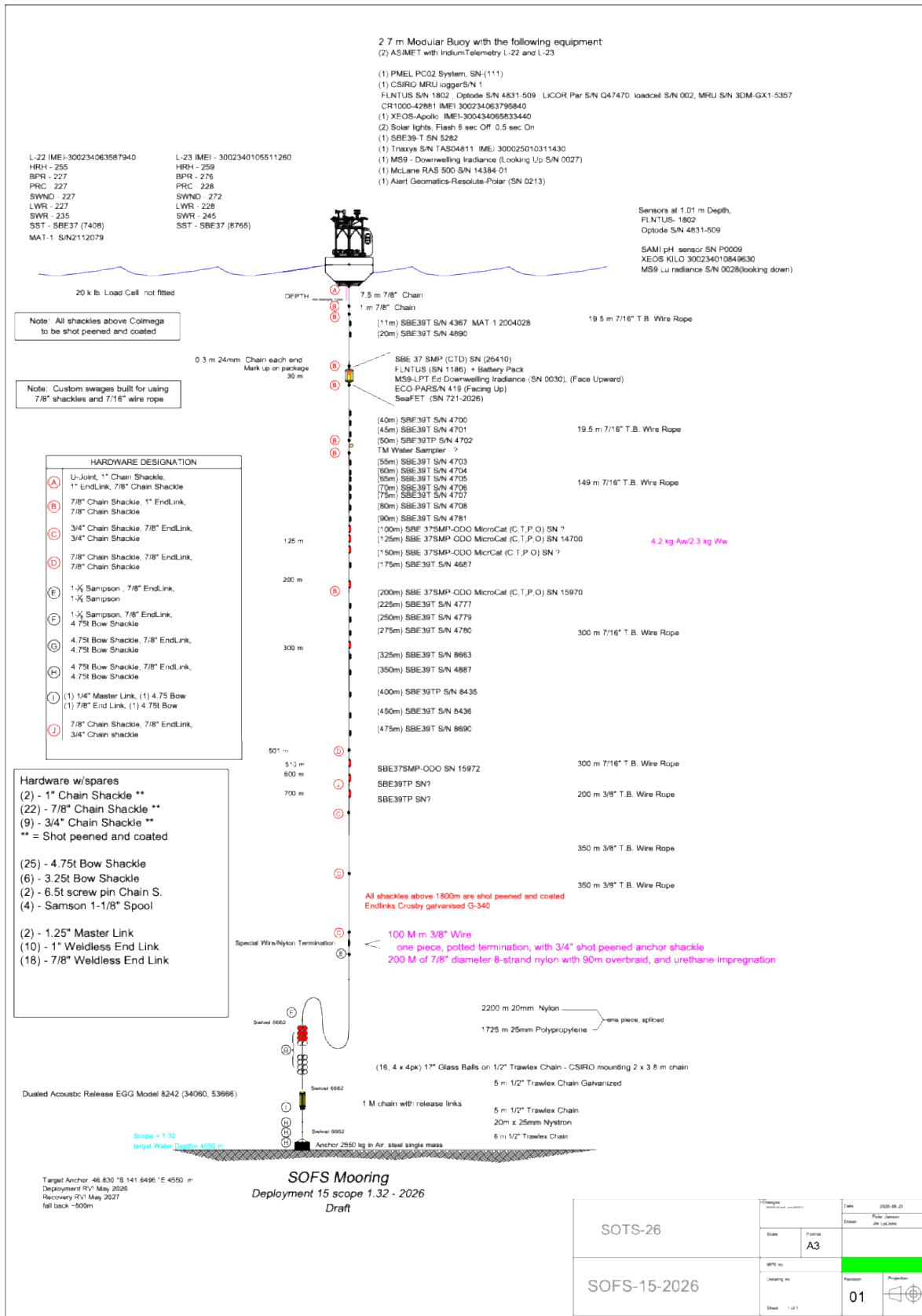


Figure x. SOFS-15 Mooring (for deployment)

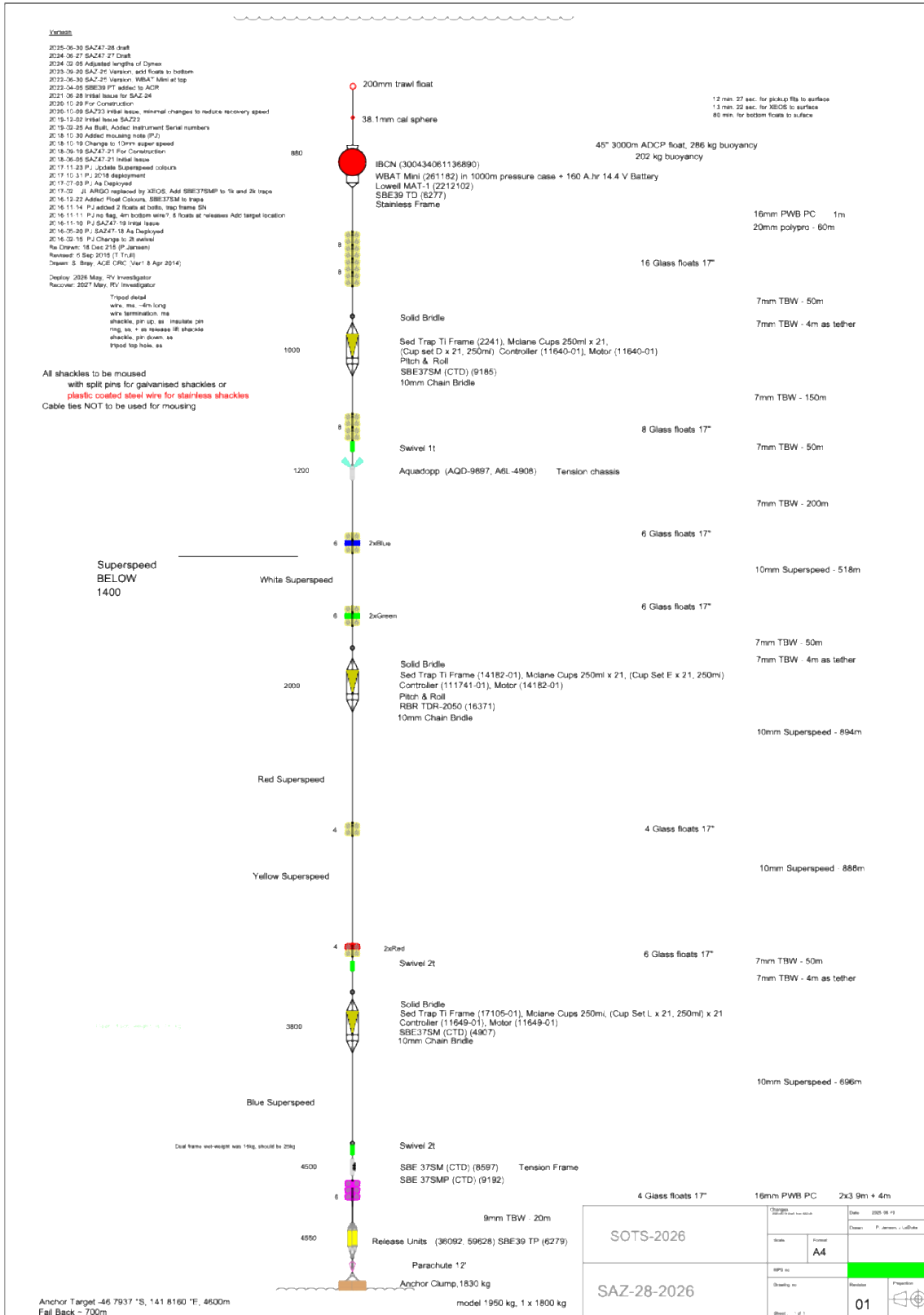


Figure x: SAZ-28 mooring for deployment

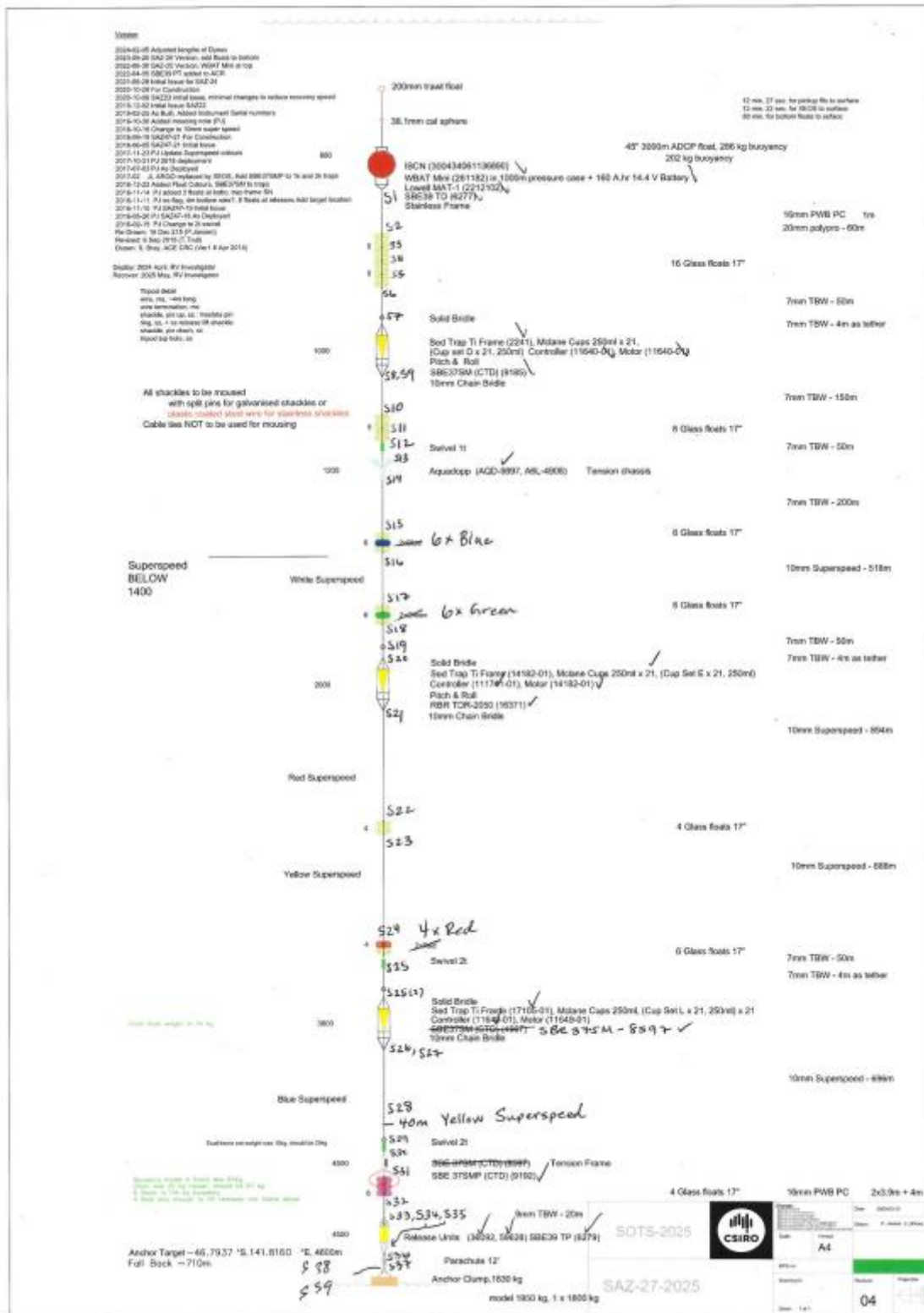


Figure x: SAZ-27 mooring (as deployed)

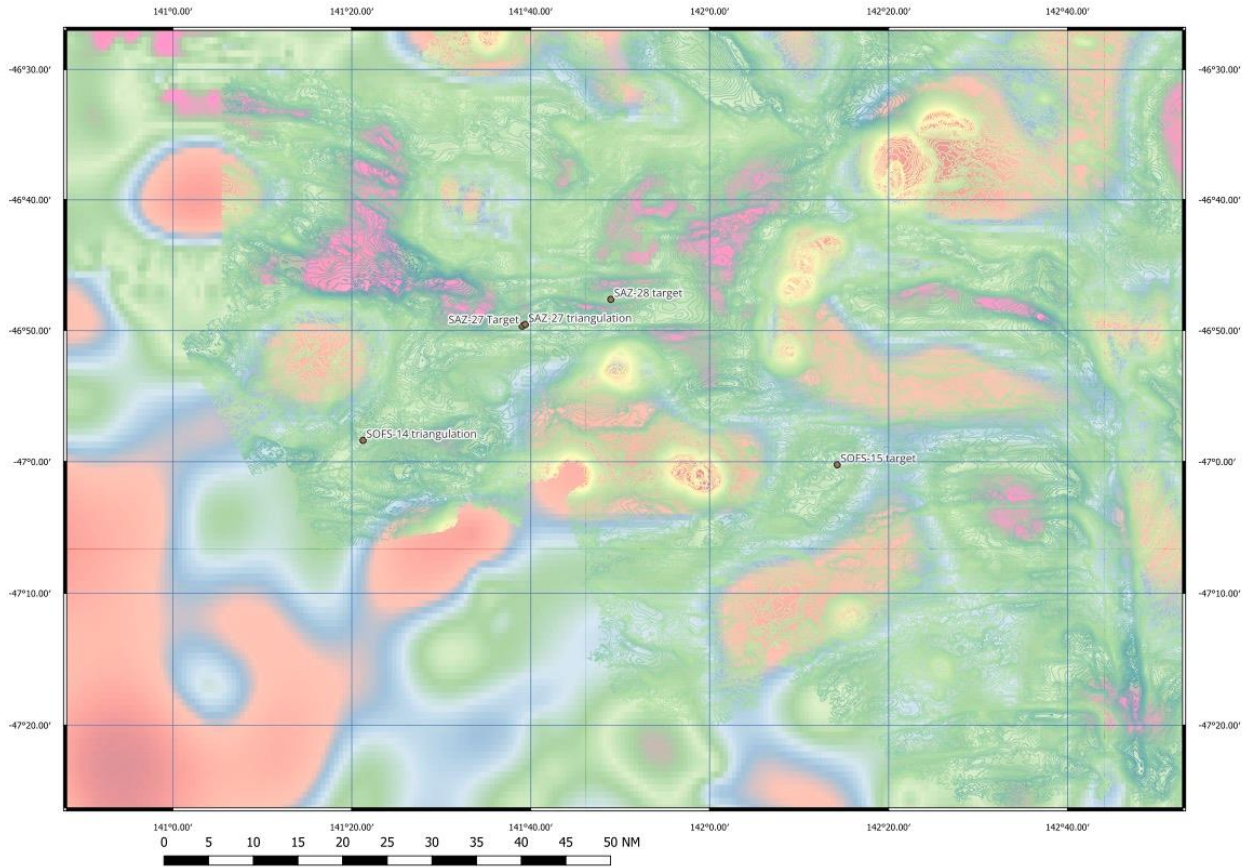


Figure x: Map of current and previous mooring anchor locations

Appendix A

Scientific equipment and facilities provided by the Marine National Facility

Some equipment items on the list may not be available at the time of sailing. Applicants will be notified directly of any changes. Indicate what equipment and facilities you require from the Marine National Facility by placing an **X** in the relevant box.

STANDARD LABORATORIES AND FACILITIES		
NAME	REQUIRED	NOTES/COMMENTS
Aerosol Sampling Lab		<ul style="list-style-type: none"> Please indicate the intended activity in this lab
Air Chemistry Lab		<ul style="list-style-type: none"> Please indicate the intended activity in this lab
Preservation Lab		<ul style="list-style-type: none"> Please indicate the intended activity in this lab
Constant Temperature Lab (Min temp: ~4°C / Max temp ~35°C)		<ul style="list-style-type: none"> Please indicate the intended activity in this lab Please indicate the required setpoint temperature
Underway Seawater Analysis Laboratory		<ul style="list-style-type: none"> Please indicate the intended activity in this lab
GP Wet Lab (Dirty)	x	<ul style="list-style-type: none"> Staging for mooring operations, storage of Argo floats
GP Wet Lab (Clean)		<ul style="list-style-type: none"> Please indicate the intended activity in this lab
GP Dry Lab (Clean)	x	<ul style="list-style-type: none"> Water collection and filtration
Sheltered Science Area	x	<ul style="list-style-type: none"> Staging for mooring operations (winch)
Observation Deck 07 Level		<ul style="list-style-type: none"> Please indicate the intended activity in this area
Internal Freezer (Dirty Wet lab) (Min temp -25°C / Max temp 0°C) Volume: >20m ³		<ul style="list-style-type: none"> Please indicate the intended activity in this area Please indicate the required setpoint temperature
Clean Freezer (Dirty Wet lab) (Min temp -25°C / Max temp 0°C)		<ul style="list-style-type: none"> Please indicate the intended activity in this area

STANDARD LABORATORIES AND FACILITIES		
NAME	REQUIRED	NOTES/COMMENTS
Volume: >2.5m ³ Co-located within the Internal freezer and separated by a door		<ul style="list-style-type: none"> Please indicate the required setpoint temperature
Blast Freezer (Dirty Wet lab) (Min temp -30°C / Max temp 0°C) Internal volume >1.5m ³ Capable of reducing the temperature of 150kg of water from +20C to -30C in one hour.		<ul style="list-style-type: none"> Please indicate the intended activity in this area Please indicate the required setpoint temperature
Cool Room (Dirty Wet lab) (Min temp 0°C / Max temp 10°C)	x	<ul style="list-style-type: none"> Storage of collected water samples 4C
Ultra-Low Temperature Freezers x2 (Main Deck) Min temp -80°C / Max temp -80°C)	x	<ul style="list-style-type: none"> Storage of collected eDNA samples
YODA Freezers (x2) (Clean Dry lab) (Min temp -20°C / Max temp 10°C)		<ul style="list-style-type: none"> Please specify if both or only one are needed Please indicate the intended activity in this area Please indicate the required setpoint temperature

MOBILE LABORATORY AND FACILITIES (MAY REQUIRE ADDITIONAL SUPPORT)			
NAME	ESSENTIAL	DESIRABLE	NOTES/COMMENTS
Modular Isotope Laboratory			If nominated, additional processes to be completed.
Trace Metal Niskin Sampling Container (TM1-blue - 20ft)			<ul style="list-style-type: none"> Used for the determination of trace metal concentrations. It is a clean laboratory containing laminar flow cabinets and is stored on the main deck (if possible).
Trace Metal Seawater Analysis Laboratory (TM2-white - 20ft)			<ul style="list-style-type: none"> Used for wet sampling of trace metal clean Niskins and is stored on the main deck (if possible).

MOBILE LABORATORY AND FACILITIES (MAY REQUIRE ADDITIONAL SUPPORT)			
NAME	ESSENTIAL	DESIRABLE	NOTES/COMMENTS
			<ul style="list-style-type: none"> Cannot be overstacked
Trace Metal Rosette and Niskin Storage Container			10-foot container
Modular Hazchem Locker			
Stabilised Platform Container			Please indicate what instruments are to be installed in the container. Cannot be overstacked
Clothing Container			The use of this container will be identified by MNF

STANDARD SAMPLING EQUIPMENT			
NAME	ESSENTIAL	DESIRABLE	NOTES/COMMENTS
Continuous Plankton Recorder (CPR)	x		*note: Use of this item must be flagged with the relevant CSIRO Oceans & Atmosphere team responsible for CPR cassette preparation and sample processing. Please discuss your planned CPR use with your VDC, who will assist in liaising with the CPR team.

SPECIALISED SAMPLING EQUIPMENT			
NAME	ESSENTIAL	DESIRABLE	NOTES/COMMENTS (THESE ITEMS MAY REQUIRE ADDITIONAL MNF SUPPORT STAFF)
TRIAXUS – Underway Profiling CTD	x		Triaxus is a pilotable towed vehicle capable of carrying a variety of instrumentation. Constant depth towing or undulating profiles (e.g. cyclic depth pattern from the surface to 200m) are possible. Towing speed depends on the tow profile, instrumentation payload and prevailing conditions. Typically, undulations from the surface to 200m are possible at 8knt, with slower speeds for deeper profiles and faster for constant-depth towing. Maximum achievable depth typically 300m to a distance of approximately 1.5km from the ship.

SPECIALISED SAMPLING EQUIPMENT			
NAME	ESSENTIAL	DESIRABLE	NOTES/COMMENTS (THESE ITEMS MAY REQUIRE ADDITIONAL MNF SUPPORT STAFF)
			Triaxus is normally configured with the following sensors as a minimum: <ul style="list-style-type: none"> • Dual temperature, conductivity and dissolved oxygen (SBE9plus and dual pumped temperature/conductivity/dissolved oxygen circuits) • PAR • Chlorophyll-A, CDROM, optical backscatter (Eco-triplet – 2000m Max) • Plankton counter (Laser Optical Plankton Counter) • Transmissometer Contact MNF for further details on other instrumentation and capability.
Desired towing profile:			
Additional instrumentation: (please supply, make and model and datasheets and a contact person for discussion on integration)			
Piston Coring System			
Gravity Coring System			
Multi Corer			
Kasten Corer			
Smith Mac Grab			
Rock Dredges			
Rock Saw			Requires trained science personnel
Seaspy Magnetometer			

SPECIALISED SAMPLING EQUIPMENT			
NAME	ESSENTIAL	DESIRABLE	NOTES/COMMENTS (THESE ITEMS MAY REQUIRE ADDITIONAL MNF SUPPORT STAFF)
Portable Pot Hauler			
Equipment to measure seawater sound velocity/CTD:			
XBT System			2 per day provided
Valeport Rapid SV			
Valeport Rapid CTD			
Valeport SVX2			
Trace Metal Rosette and Bottles			
Trace Metal In-situ Pumps (x6)			<ul style="list-style-type: none"> • See non-MNF owned section below for additional 2 units. • Science team to organise and pay for battery packs for this system (+ spare). • They can be sourced through a supplier such as 'Batteryworld Hobart' (Graham Cowie, 03 6272 3900) who has made these previously. • The science teams need to calculate how long they will be deployed and bring enough batteries to cover their deployment times. They are rated to 30 Amp hours, which equals to 36,000 litres of sea water being filtered.
Deep Towed Camera			
Drop Camera			
Sherman Epibenthic Sled			Stern ramp must be removed to operate this system.
Brenke Sled			
Hydro-Bios MultiNet (Mammoth) (1m x 1m)			Please specify 100-micron, 335-micron, or 500-micron mesh

SPECIALISED SAMPLING EQUIPMENT			
NAME	ESSENTIAL	DESIRABLE	NOTES/COMMENTS (THESE ITEMS MAY REQUIRE ADDITIONAL MNF SUPPORT STAFF)
<i>(has replaced the EZ net)</i>			Can be used in a vertical or horizontal operations
Surface Net (1m x 1m)			Please specify 335-micron, 500-micron, or 1,000-micron mesh
Bongo Net			750mm frame, 500-micron mesh net and 335-micron cod end
Beam Trawl			
MIDOC			Multiple opening/closing net system with cod ends- suitable for pelagic trawls
Pelagic Trawl System (net, doors)			Contact MNF to discuss net and mesh dimensions
Demersal Trawl System (net, doors)			Contact MNF to discuss net and mesh dimensions
RMT-8 (Rectangular Midwater Trawl) Utilises a single warp so can be deployed on the general-purpose towing wire in self-contained mode. Must be deployed with stern ramp covered.			8m ² mouth area Tow speed ≤2 knots
RMT-16 (Rectangular Midwater Trawl) Utilises a single warp so can be deployed on the general-purpose towing wire in self-contained mode. Must be deployed with stern ramp covered.			16m ² mouth area Tow speed ≤2 knots
Trawl Monitoring Instrumentation (ITI) (2,000m depth limit)			MNF to identify this need, dependent on pelagic or demersal trawling requirement
Stern ramp	EXPOSED	INSTALLED	MNF to identify this requirement

RESEARCH SUPPORT INFRASTRUCTURE			
NAME	ESSENTIAL	DESIRABLE	NOTES/COMMENTS
Saltwater Ice Machine (Dirty Wet lab)			
Radiosonde Receiver System			
Laboratory Incubators (Clean Dry lab)			
Deck Incubators			Temperature controlled deck incubators
Milli-Q System		x	For eDNA sampling
Sonardyne USBL System			

SCIENTIFIC / SAMPLE ANALYSIS SYSTEMS				
MICROSCOPES:				NOTES/COMMENTS
BRAND / MODEL	TYPE	ESSENTIAL	DESIRABLE	Refer to the "MNF microscopes procedure" for more information
Leica / M80	Dissecting			
Leica / M80	Dissecting			
Leica /MZ6	Dissecting			
Olympus / CH	Compound			
Olympus /CH	Compound			
Leica / MTU282	Camera tube			
Adapters for tube / Nikon	Pentax			
Ring Light *2 / MEB121	LED			
Heavy Duty Electronic Balance (80kg)				
Medium Duty Electronic Balance (15kg/5g resolution)				

SCIENTIFIC / SAMPLE ANALYSIS SYSTEMS			
MICROSCOPES:			NOTES/COMMENTS
Light Duty Electronic Balance (3kg/1g resolution)			

Underway systems

ACOUSTIC UNDERWAY SYSTEMS			
NAME	ESSENTIAL	DESIRABLE	NOTES/COMMENTS
75kHz ADCP			
150kHz ADCP			
Multi Beam Echo Sounder EM2040-MKII 200-700kHz (0 – 250m approx.)			
-Multi Beam Echo Sounder EM124 12kHz (100m to full ocean depth)			
Multi Beam Echo Sounder EM712 70-100kHz (0 – 1000-m approx.)			
Sub-Bottom Profiler SBP29			
-Scientific Narrowband/Broadband Echo Sounders EK80 (6 bands, 18kHz - -333kHz)			EK80s will be used in narrowband mode unless otherwise requested Quantitative measurements from scientific echosounders requires sphere calibration in the watermass of sampling
Multibeam Scientific Echo Sounder ME70 (70100 kHz)			
Omnidirectional Echo Sounder SH90			
Gravity Meter			

ATMOSPHERIC UNDERWAY SENSORS			
NAME	ESSENTIAL	DESIRABLE	NOTES/COMMENTS
Nephelometer			
Multi Angle Absorption Photometer (MAAP)			
Scanning Mobility Particle Sizer (SMPS)			
Radon Detector			
Ozone Detector			
Condensation Particle Counter (CPC)			
Picarro Spectrometer (analysis of CO ₂ /CH ₄ /H ₂ O)			
Aerodyne Spectrometer (analysis of N ₂ O/CO/H ₂ O)			
Cloud Condensation Nuclei (CCN)			
Polarimetric Weather Radar			
Filter Aerosol Sampling units (FAS) x 3			<p>Used for collecting physical aerosol samples on filters.</p> <p>FAS includes pumps, filter holders, flow controllers, totalizer, Very Sharp Cut Cyclone (VSCC) PM1 and PM2.5.</p> <ul style="list-style-type: none"> User to specify how many units are required (maximum 3 supplied by MNF). User to provide own filters. User to outline sampling requirements with MNF Seagoing Instrumentation Team (SIT) i.e. ship exhaust sample avoidance etc.

UNDERWAY SEAWATER SYSTEMS AND INSTRUMENTATION			
NAME	ESSENTIAL	DESIRABLE	NOTES/COMMENTS
Thermosalinograph	x		

UNDERWAY SEAWATER SYSTEMS AND INSTRUMENTATION			
NAME	ESSENTIAL	DESIRABLE	NOTES/COMMENTS
Fluorometer			
Optode	x		
pCO2	x		

SEAWATER SYSTEMS			
NAME	ESSENTIAL	DESIRABLE	NOTES/COMMENTS
Trace metal clean seawater supply	x		Collection of water for processing of sediment trap samples
Scientific clean seawater supplied to laboratories			
Raw seawater available on deck and in laboratories			

EQUIPMENT AND SAMPLING GEAR REQUIRING EXTERNAL SUPPORT (MAY REQUIRE ADDITIONAL SUPPORT FROM APPLICANTS)			
NAME	ESSENTIAL	DESIRABLE	PLEASE GIVE THIS CAREFUL CONSIDERATION, AS THERE IS NO GUARANTEE THAT THESE RESOURCES WILL BE AVAILABLE UNLESS SPECIFICALLY REQUESTED. LIAISE WITH YOUR VOYAGE OPERATIONS MANAGER AS REQUIRED. ADDITIONAL STAFF MAY BE REQUIRED FOR THESE ACTIVITIES.
Seismic Compressors			<ul style="list-style-type: none"> Additional crew and seismic acquisition personnel will be required to be onboard to support this system. Number of personnel TBD by the MNF. The science party is to provide an onboard seismic data processing resource.
Seismic Acquisition System			<ul style="list-style-type: none"> Additional crew and seismic acquisition personnel will be required to be onboard to support this system. Number of personnel TBD by the MNF. The science party is to provide an onboard seismic data processing resource.

NON-MNF OWNED EQUIPMENT WHICH MAY BE ACCESSED			
NAME	ESSENTIAL	DESIRABLE	PLEASE GIVE THIS CAREFUL CONSIDERATION, AS THERE IS NO GUARANTEE THAT THESE RESOURCES WILL BE AVAILABLE UNLESS SPECIFICALLY REQUESTED. LIAISE WITH YOUR VOYAGE OPERATIONS MANAGER AS REQUIRED. ADDITIONAL STAFF MAY BE REQUIRED FOR THESE ACTIVITIES.
D & N Francis winch			15mm electro-optical cable
Box Corer			
UTAS In-Situ Pumps (x2)			
EM2040			Shallow water multibeam echosounder system

Special Requests – MNF Scientific Equipment and Facilities

- Describe any special requirements here.
- Do you have video conferencing / data communication requirements?

Appendix B

User Supplied Equipment

The table below will include information provided by the Chief Scientist / Principal Investigators in the '*Equipment Manifest-user supplied voyage specific*' document. The Chief Scientist will co-ordinate the completion of this Manifest with all PIs and forward the completed document to the Voyage Operations Manager.

NOTE: User supplied equipment will remain the responsibility of the science party throughout the voyage. The MNF technicians and ship's crew endeavour to assist wherever possible, however the MNF take no responsibility for the pre-deployment checks or repairs and maintenance of this equipment

This information will also be used for the mobilisation list and deck plan for the voyage.

Owner	Item name	Weight	Dimensions	Location on Vessel
Elizabeth Shadwick / CSIRO moorings	6 x SOFS wire spools, 4 x saz rope spools	1200kg		Main deck
Elizabeth Shadwick / CSIRO moorings	hydraulic feeder	250kg	150W x 60D x 160H cm	main Deck
Elizabeth Shadwick / CSIRO moorings	Bullhorn mooring fairlead	100 kg	1m	Main deck
Elizabeth Shadwick / CSIRO moorings	Mooring winch	1.5 tonne	2x1x1.5 m	Main deck / Sheltered Science Area
Elizabeth Shadwick / CSIRO moorings	Half height open top moorings container	5 tonnes	20ft	Main deck
Elizabeth Shadwick / CSIRO moorings	SOFS float and recovery cradle	2.5 tonnes	3x3 m	Main deck
Elizabeth Shadwick / CSIRO moorings	Mooring anchor stacks x 2	3 tonne and 2 tonne	3x1 m	Main deck
Elizabeth Shadwick / CSIRO moorings	Full height container for storing and working on sediment traps	4.5 tonnes	20ft	Main deck
Elizabeth Shadwick / CSIRO moorings	3 cage pallets of mooring equipment	500kg per cage 3 tonnes total	1 x 2 m each	Main deck

OFFICIAL

Owner	Item name	Weight	Dimensions	Location on Vessel
Elizabeth Shadwick / CSIRO moorings	Deck mounted pneumatic line thrower (grappling gun)	50 kg	0.5 m	ESC 1
Elizabeth Shadwick / CSIRO moorings	Acoustic release deck unit	5kg	0.5 m2	Operations Room
Elizabeth Shadwick / CSIRO moorings	Hydraulic High Pressure Unit (HPU)	850kg	approx 120W x 100D x 140H (cm)	Sheltered workshop
Elizabeth Shadwick / CSIRO moorings	2 x Air Spoolers, 1 x brake spooler	100kg each	approx 120W x 120D x 100H (cm)	Main deck secured to half height
Elizabeth Shadwick / CSIRO moorings	transition box	300kg	150W x 150D x 100H cm	main deck
Elizabeth Shadwick / CSIRO moorings	Releases for SOFS / SAZ + spare	100KG.	120W x 70D x 40H cm	Main Deck
Elizabeth Shadwick / CSIRO moorings	1 pallet of blocks	400Kg	110W x 110D x 50H cm	Main deck
Elizabeth Shadwick / CSIRO moorings	1 cage for gear	250kg		wet lab
Elizabeth Shadwick / CSIRO moorings	2 tether cages	1740Kg	110W x 180D x 220H cm	Main deck
Elizabeth Shadwick / CSIRO moorings	1 SAZ 45" ADCP float and frame	300kg	240w x 120D x 96H cm	Main deck
Elizabeth Shadwick	1 x Argo Float	20kg each	1950L x 260W x 260D (in crate)	Dirty Wet Lab
Elizabeth Shadwick / CSIRO moorings	ESC1 moorings container	5 tonnes	20ft	main deck
Ruth Eriksen	Box of nets	5kg	36L x 23W x 33H	Clean wet lab
Ruth Eriksen	Box of sampling consumables (1 - tax)	5kg	57L x 38W x 33H	Clean wet lab
Ruth Eriksen	Box of sampling consumables (2 - cocco)	8kg	55L x 38W x 26H	Clean wet lab
Ruth Eriksen	Bucket of sampling supplies for Niskins	5kg	57L x 38W x 33H	Clean wet lab
Ruth Eriksen	Miscellaneous tie-downs etc	6 kg	44L x 33 W x 23H	Clean wet lab
Ruth Eriksen	Wooden box for bench work	7 kg	133L x 49W x 11H	Clean wet lab

OFFICIAL

Owner	Item name	Weight	Dimensions	Location on Vessel
Ruth Eriksen	Box of sampling consumables (3 -FC/DNA)	10 kg	57L x 38W x 33H	Clean wet lab

Appendix C

Hazardous Materials Manifest

Refer to IN2026_V03 Hazardous Materials Manifest spreadsheet.