

**Marine Facilities Advisory Board
National Oceanography Centre, March 23rd 2018**

Prof Mark Inall, SAMS – Chairman (MI)

Dr Sophie Fielding, British Antarctic Survey (SF)
Dr Maarten Furlong, National Oceanography Centre (MF)
Prof Angela Hatton, National Oceanography Centre (ADH)
Mr Andy Henson, National Oceanography Centre (AH)
Prof Karen Heywood, University of East Anglia (KH) by VC
Dr Erica Koning, Royal Netherlands Institute for Sea Research (EK) by VC
Mr Randolph Sliester, British Antarctic Survey (RL)
Mr Leigh Storey, National Oceanography Centre (LS)
Dr Andy Rees, Plymouth Marine Laboratory (AR) by VC
Dr Carol Robinson, University of East Anglia (CR) by VC
Dr Mike Webb, Natural Environment Research Council (MW)
Prof Russell Wynn, National Oceanography Centre (RW)

Secretariat: Jackie Pearson, National Oceanography Centre (JP)

Observing: Dr Natalie Clark, Natural Environment Research Council (NC)

Apologies

Dr Graham Allen, BODC
Mr Robert Gatliff, British Geological Survey (RG)
Professor Matt Mowlem (NOC)
Dr Phil Nightingale (PML)
Prof Christine Peirce, University of Durham (CP)
Ms Julie Pringle-Stewart, National Oceanography Centre (JPS)

Item 1 Welcome and matters arising from meeting minutes from May 2017

- 1.1 MI advised the Board that Dr Carol Robinson would be joining this meeting as the incoming Chair, as this would be MI's last meeting as Chair. CR will be taking over as MFAB Chair in April 2019.
- 1.2 The minutes are to be issued as a draft, and posted on-line, as soon as possible. Amendments were noted as follows:
 - Page 1, 1.3 – the business case is referring to the OCEANIDS business case so this should be changed.
 - Recheck document for instances when names have been used rather than initials and correct.
 - P 6, 5.5 - Ray Leakey is the science lead on the polar vessel so this should be added, in brackets.Once the changes are complete, the draft minutes can be published.
Action: MFAB Secretariat

- 1.3 MI went through the actions list. SF asked if the visibility of the MFAB website could be enhanced. RW agreed to help with this as he now has oversight of the NOC website. Damion Cook is now the Communications Officer who is the lead for technology and has this all in hand. MI confirmed that the link about the capital expenditure was now available. NERC's pages on MFAB need to mirror the NOC MFAB pages. **Action: Secretariat**
- 1.4 Regarding the action at 6.2, Dr Leigh Marsh updated the NMEP web pages so these are community facing and there is more information available now.

Item 2 Membership

- 2.1 AH asked if it would be possible for information to be made available about what science areas members represent, e.g. in terms of types of equipment used and about their science areas.
- 2.2 We are at a stage when many members are due to end their term. MI will continue through this year but CR will take over as Chair at the next meeting. There is a need for an influx of new scientists onto the MFAB. How do we achieve this? The opportunity could be advertised to the community? Previously, we have taken a selected approach amongst ourselves but perhaps we should ask the wider community now, as an open call. This was agreed but it would be best to try to stagger the points at which members leave. CR suggested keeping four members on the Board for one more year. Next year's meeting would see a mix of new members joining as others leave. MI had received some suggestions. It is important to be clear about what areas of marine science should be represented.
- 2.3 There should be a call for new members as soon as possible. MI will draft some text and circulate to the board for comment and input. The call should be linked to the Terms of Reference, the NMF Technology Road Map and the NMEP inventory list. We need to think about the primary equipment users, and those who are knowledgeable about certain pieces of equipment.
Action: MI
- 2.4 RW asked if there were still gaps, whether members still target individuals. MI had already had some suggestions from existing members and agreed to ask members if they would also like to suggest colleagues to apply.
- 2.5 LS asked for clarity on the roles of members. For example, Professor Matt Mowlem (MM) – is Matt's role that of an advisor? Also, is RS attending as an observer? ADH confirmed that MM is on the Board to advise about what is needed. Is there categorization within the NOC core group in terms of science area or equipment? It was suggested that there should be representation on the Board from other operators of large NERC assets. There needs to be definition of the group that is non-NOC core membership e.g. BAS, BGS etc. SF asked whether MFAB is a NOC or NERC Board. MW advised that the board reports both ways. The authority on capital is under NOC. As NOC is still within NERC at the moment, NERC retains an interest which is why MI attends the Cruise Programme Review Group meetings. This

is reflected in the first paragraph of the MFAB ToR. MI suggested that in future, NERC may take ownership of the MFAB completely although this is not for this Board to decide.

- 2.6 BAS and BGS operate large capital assets on behalf of NERC. BAS is a user of the equipment pool and contributes to discussion on the contents. MI commented on the value of MFAB to enable discussion about when new equipment is purchased. LS added that it is helpful to understand who attends and what advice they can offer. It is important to match people to capability and we must be careful also not to miss off science groups. Every part of the science community must be represented. It is important to get a broad spectrum of representation and for us to be aware of what expertise members can bring.
- 2.7 MW said that canvassing the community has sometimes been done well but sometimes colleagues have not always had the time to review equipment needs. For example, we might have got more feedback if there had been an open call on the new Autosub 3 but we didn't do this. This group should receive evidence and provide advice rather than canvassing and providing a steer. At the moment, we are dependent on one person to represent a section of the community. For example, if National Marine Facilities advises MFAB that there is a challenge on the horizon, this might start an exchange of information with wider community. MI commented on how we reach the 'wider community': there is the NERC marine listserver and the NOC Association listing. MW added that when there is a big decision to be made, for example, if there needs to be a decision on what to deprioritize, then we may need to adopt a more rigorous process.
- 2.8 SF said that submitting evidence independent of collating is the starting point. LS commented on the need to review data. For example, has the equipment been requested in the last five years, how often has it been used, can this capability be bartered, etc.
- 2.9 MW mentioned an IODP survey that Professor Damon Teagle of the University of Southampton had conducted. He went to each department with an interest and the onus was on each person to respond. SF added that she canvasses input by contacting everyone on their email and following up for feedback. She added that the marine listserver is a good method of contacting the community. If we give the community an opportunity to respond then the onus is on them to respond. There may be a risk that we may not know everyone with an interest. ADH advised that NERC can provide data on who has worked in certain areas. KH suggesting using the NERC Marine Listserver and the Challenger Society. MI asked for any ideas about suggestions for new items of equipment to be sent to the Secretariat who could then circulate via the NERC marine list server, the Challenger Society and the NOC Association. **Action: All and Secretariat**
- 2.9.1 There is no reference in the ToR as to how we connect with the community. ADH added that whilst it is good to circulate information, there is a responsibility on the community to contribute too. CR asked whether we could

include a paragraph in *Challenger Wave*. For example, a note about this MFAB meeting and advise to sign up to the NERC Marine Listserver in order to get updates. Write a note about this for Challenger Wave. **Action: Secretariat**

2.9.2 NC advised that there is no longer a marine listserver as the format has changed recently. *Post meeting note: the Secretariat checked on this with NC.*

Item 3 RRS *Discovery* and RRS *James Cook* update

3.1 RRS *Discovery* – the business case for *Discovery* required endurance for 50 days. Currently, this is between 40 and 45 days. Endurance depends on fuel usage and the amount of equipment on board. The number of berths on *Discovery* has been an issue but we are adding another cabin this summer. There may be 30 scientific berths. LS mentioned that RRS *Discovery* was now compliant for operating in Polar Waters with the RRS *James Cook* to follow this year. The bandwidth on the ships has now been increased in response to feedback from PIs.

3.2 RS advised that the launch of the SDA will take place on 17th May 2018 and the acceptance date will be 31st October after which BAS will undertake one year of engineering trials followed by three scientific trials, then the ship will travel down south and undertake a 40 day arctic rehearsal expedition. BAS will go to the Arctic for a rehearsal expedition after which the ship will be considered fully commissioned. MI noted that for the Arctic trials expedition, there had been a request for input from the community, announced by NERC this week. The Arctic rehearsal will include geophysical, geological and geochemistry components.

Item Four Working Groups

4.1 MI advised that we have adopted the seismic capability working group which is on-going and rebranded as a MFAB working group. LS said that it was a shame that Professor Christine Peirce (CP) was unable to attend the meeting as she had been the driving force behind this.

4.2 There are five options for review. 1.) remove capability 2.) retain current capability 3.) barter with OFEG partners 4.) charter or 5.) put together a business case to invest in it. CP has done a lot of work in looking at the capital on this and AH has been looking at the on-going costs. We need to establish whether we have achieved some of the savings that we anticipated. We want to deliver the report to the next Cruise Programme Executive Board (CPEB) and will forward to MI beforehand. The MFAB Secretariat will circulate the report to the membership before it goes to the October CPEB meeting. **Action: MI and Secretariat**

- 4.4 MI had asked the MFAB for suggestions of new working groups and we received the nomination for the Data within the Marine Facilities. CP sparked the initial decisions with some colleagues outside this Board.
- 4.5 MI said that he would like to discuss membership of this board. There is a list of on-going initiatives and it would be good to invite discussion. SF spoke about a review of the Texas data logging software for the NERC ships, including the SDA. There are different systems which may not be capturing all the information needed. There is a need to look at data flow throughout. There may be a need to identify more training. There needs to be a review of existing systems to review their efficacy to check that they are fit for purpose. SF said that some of this may occur because of the SDA but there needs to be request out to the community to check that all is well.
- 4.6 MF asked if the work on SDA is linked into what NOC is doing currently? He is concerned that we may build a system that works well for the SDA but will it work for the *James Cook* and *Discovery*? Any system will need to ensure that the needs of the entire fleet are met. AH said that NOC had approached Texas originally because this was the preference of the Ocean Facilities Exchange Group.
- 4.7 RL added that on the SDA, BAS is delaying adding the IT kit until there is more certainty. BAS will wait to add until before the trials begin. SF explained that BAS is trialling Texas at the moment to be certain that this is the system that they want. AH noted that this is what the data group could help determine.
- 4.8 LS said that the notes from the WG should complement and not duplicate other documentation. The first meeting should say what the WG is intending to look at and MFAB is the right place to present this. This is a huge area and there is a lot of work going on. MI agreed that there is more than just ship-side issues to consider. For example, we need to think about the flow of data management both across ships and beyond the ships. We need to gauge whether there are sufficient concerns in our community to make a change. RL advised that in terms of the SDA, the entire server and network system is mocked up in Cammell Laird. He suggested gathering some targeted information on vessels with a section in the post expedition assessment form as this might be a good way of targeting the ship's users? Is there a post-user survey on the MARS platforms? Is this data logging system working for you? All of this leads back to the CPRG.
- 4.9 SF advised that BAS is writing a data logging specification and this will be reviewed by scientists and engineers so that they can review and make suggestions. We will look at the specification alongside the programmes to check that this will work. There is an onus to go out to the community to get more knowledge to see what else should be added. RL suggested that we need to engage with the other NERC vessel operators so that we don't just have a bespoke system that will only work on one vessel. MF asked whether this discussion was about hardware or software. It is important to be clear

about the terminology. If the hardware is in, and there is then a need to change it, this is painful!

- 4.9.1 MI asked about membership of the Data working group. He suggested that Dr Graham Allen should lead and that we should include Dr Ray Leakey. AR asked for clarification on the nature of the problem on data. Is it the case that data is not being transferred correctly? It is important to involve BODC from the start. SF added that there have been issues around the QC (quality control) of the data. LS agreed we need to know if the systems are fit for purpose. Data needs to flow in, in the right format and then be archived. MI suggested involving someone on the group who has experience in this and nominated Andy Rees who agreed to join. At this point MI said it was also important not to lose sight of the great stuff we do; let's not be too negative. MI asked for a nomination of a contact to be involved, from the Marine Autonomous and Robotic Systems team and MF nominated Alvaro Lorenzo Lopez. AH suggested Juan Ward who is Head of Scientific Systems and manages the Texas systems. SF added that there are others in the community whom it would be good to involve. SF added that there is no criticism, simply an awareness of certain issues and we just need to find out how we fix them. Data collection should be standardised across the three platforms. Dr Graham Allen needs to be approached to set up a working group. **Action: MI**

Item 5 Marine Capital Equipment

- 5.1 MF spoke to this item which concerns non-MEP capital that will work its way into the NMEP by 2021. **Autosub Long Range 1500m Rated Platform** – There have been problems with the vehicle's pressure vessels. The specification of the ALR 1500 is similar to Autosub6000 but will have 2.5 times the energy. We will be building terrain navigating capability into the vehicle which will be able to stay subsurface for longer periods of time that will enable, for example, polar crossings. We will be updating the control system and are looking to upgrade both the hardware and software and should be able to integrate sensors more easily. The vehicle will be fitted with a turbulence probe and will have options to integrate low power sensors within the MEP.
- 5.2 **Autosub AS2KUI** will enhance our under ice capability. The xxx (UIC?) will be available in 2021. The vehicle's sensors will be similar to Autosub6000 and will have an improved obstacle avoidance system. We are upgrading the on board control systems which will have the same code base as the Autosub Long Range 6000. It will be easy to integrate sensors onto this vehicle.
- 5.3 **C-Worker 4** has been designed to be launched and recovered from our ships. The USBL system will enable us to track the AUV 6000 thereby saving ship time. The continuous tracking capability will enable us to improve navigational accuracy. We will leverage capability within the NMEP to integrate sensors onto the vehicle and it will be possible to use the C-Worker for testing sensors.

- 5.4 The **C2 (MAS Platform Command-Control System)** project is using agile development techniques and software system in stages. Two phases: 1.) build a standardised piloting interface and 2.) stream-line data flow into the BODC. This will be integrated into the MFP portal and we will be developing an autonomous deployment form. We are looking to pull the data through to the BODC. We are building the infrastructure and will be looking at automated piloting. There will also be a simulation capability.
- 5.5 There are five marine sensor projects but these may not end up in the NMEP. We will integrate the sensors into the fleet and there is a trials plan and ultimately, they will be integrated into the vehicles.
- 5.6 MI noted that there needs to be a dissemination communications plan for OCEANIDS. RW explained that NOC is looking to target a number of events when we can highlight these developments. There is a poster that is ready to go onto the NOC web site. The NOC is developing a trials plan and hopes to share elements of this with the community. There will be an anticipated timeline for when all of these new assets become available.

Item 6. Capital Expenditure Proposal Form

- 6.1 There will be an announcement via the marine list server and through the NOC Association. **Action: Secretariat**
- 6.2 Whilst there are standard funds available annually to support this, the vast majority of those funds are needed to replace and/or maintain existing equipment. It will be made clear that this is the case, and that the list will exist primarily to be used in the event of unpredictable injections of capital cash by NERC, UKRI or other Government agency. If there is a request for an item that isn't funded in one round, the application won't be discarded but will be carried forward to the next round. It will be useful to have a ready to go list of items that have been requested.
- 6.3 KH asked why the form only refers to RRS *Discovery* and the RRS *James Cook*. What about the RRS *James Clark Ross*? What about barter ships? There may be scientists who have glider campaigns who are not on ships at all. MI advised that this is unintentional and the form should be for any users of the NMEP. This needs to be corrected. **Action: Secretariat**
- 6.4 KH queries the reference to ship-based equipment – does this mean items that are permanently attached? MI confirmed that the reference means anything that is in the pool. SF noted that this should be amended to 'marine equipment'. This does not only refer to equipment that is permanently attached. These corrections need to be made and then advertise its availability. **Action: Secretariat**

7. NMF Technology Road Map

- 7.1 We are at a point when we are looking for final comments before publishing the document. AH advised that the seismic section has been revised and we

have upgraded the gravity meters. There was a plan to try these on the SDA but we were uncertain as to whether the SDA has a gravity meter as we thought the purchase had fallen through. RL advised that as far as he was aware, this had been ordered and there are no issues (RL later confirmed the gravity meter had been ordered) AH commented that as this is the case, we will try the gravity meter on the RRS *James Cook* in order to see what needs upgrading. RL agreed to check on this. **Action: RL**

- 7.2 AH advised that NOC is trying to upgrade/modernise the lab containers which are expensive. The Calibration Laboratory is an up and running facility. We have space capacity and this is quick and more economical than going elsewhere. On HyBis, the command model is due to be upgraded.
- 7.3 MF advised that NMF is looking to develop a virtual control room for the ROV. This will use increased bandwidth on the ship.
- 7.4 We are trialling a deep glider from the University of Washington. There will be rechargeable batteries for the Slocum gliders.
- 7.5 MI advised that he has some feedback from Christine Pierce. We need to get the document signed off and make it available. With reference to ACSIS, RW asked if it would be possible to add depth capability to projects using a USV to harvest data from moorings.
- 7.6 RL advised waiting to see how the 40m corer works on the SDA first because the Japanese had used the same system and lost it on the first deployment. We should resolve this on the SDA first before we invest again.
- 7.7 AR queried the fact that there is no mention of CTD systems. AH explained that we haven't identified growth areas for CTD systems. SF said that she was aware of some and would pass these on. **Action: SF** AR added that it is important to mention the capabilities and packages that available for the CTDs as this will be of interest to the community.
- 7.8 EK mentioned the coring systems. A couple of years ago, NMF bought a sensor system from Ifremer to take care of corings so that it would be more reliable. EK asked if this has ever been implemented as it is not in this document. It was intended to ensure that sediment samples are uniform. AH agreed to check this.
- 7.9 With respect to the section on gliders, RW asked if it will be possible to have a micro AUV.
- 7.9.1 SF advised that BAS has just bought some containers that have been designed to fit the SDA. It may be possible for them to be put on the deck of a ship.
- 7.9.2 There is a workshop in May but only part of the first day revolves around the SDA.

- 7.9.3 RW added that integrating unmanned aerial vehicles with ships and Marine Autonomous Systems and we don't have this capability in NMFP but it is in BAS and SAMS and asked for views from the Board. MI said that if there is a future investment in MAS, we should look at unmanned aerial vehicles. MF added that NOC is looking are exploring the use of quadcopters. The Schmidt Ocean Institute has a system that had a vertical take-off capability with 12 hours endurance. MI suggested that we will look at the capabilities of aerial vehicles and in the future, these will be part of the drop down menu for when colleagues are planning research expeditions. RS added that NOC has an extended range of fixed wing vehicles that are being adapted. There is also a group in BAS that is dedicated to developing unmanned aerial vehicles. MF added that there is a lack of science drivers – for example, what are the applications? We are clear on the use of the quadcopter but what are the science users? RS suggested talking to BAS as we can talk about the science applications of the unmanned fleet. MI added that the document just needs a pointer about the aspirations. MI advised that SAMS has a small ROV and two AUVs and agreed to send a list of equipment to **AH. Action: MI**
- 7.9.4 MI wrapped up this section by asking that further comments are received two weeks from today. After that, the Roadmap will be published. JP to send reminder. **Action: Secretariat**
- 7.9.5 CP has communicated details of some errors to LS, including that the Roadmap is lacking of imagination and inspiration and that it could be business damaging if made publically available. MI asked for a view from the Board. Does this relate to commercially sensitive information? MF said that there was already information about vehicles on-line. No members present agreed that publication of the roadmap would be business damaging. Once updated with final comments, the Technology Roadmap needs to be advertised to the community. AR suggested adding it to the Marine Facilities Portal. The Roadmap will be a useful reference in terms of completing the Ship-time and Marine Equipment (SME) forms. **Action: AH**

Item 8. Marine Environmental Interaction Policy

- 8.1 CP and RL were the driving power behind this. The policy was adopted by the CPEB two weeks ago. It provides for an environmental impact assessment (EIA) to be undertaken each time a NERC ship goes to sea. There are two types of EIA, standard and enhanced. The policy indicates what sort of expedition requires an 'enhanced' assessment. Most expeditions require a standard assessment.
- 8.2 The intention is to start completing EIAs for the RRS *James Cook* and RRS *Discovery* from 2019 onwards. The EIAs will be presented at the six monthly planning meeting and any mitigating actions discussed. There is an intention to kick this off with the SDA this year although this may not fit in with the initial ship trials. There will be a recruitment process to provide for one person to be designated as an assessor to support P.Is and we have had an initial discussion with BAS as to how this would work. This is good for us and for NERC. In theory, the first meeting for these may take place Oct/Nov this year.

SF added that this will mean an EIA for every expedition, whereas before these were only required for those expeditions where the type of work was deemed to be more sensitive. For BAS there is an EIA for everything north or south of 60°.

Item 9 The National Marine Facilities Portal

9.1 MI talked through Colin Day's paper about the updates on the Portal that weren't there this time last year. SF asked whether BAS will be able to cache the portal on the JCR and the SDA? LS agreed to check this with Colin Day
Action: LS

9.2 MI advised that autonomous vehicles are now in the portal. The link to the NMEP listing is being delivered this week. We are now allocating equipment to expeditions via the NMFP. MI suggested that to save him time, should there be some costings functionality added? EK agreed that it is helpful if scientists, in planning an expedition, can have a costing running alongside their application, in real time, to see how the costs build. This would be useful functionality, especially with large, expensive items of equipment.

Item 10 Any other business and date of next meeting

10.1 SF spoke about the assessment of noise that had been raised during the last MFAB meeting and asked if there has been any movement on this? The query concerned RRS *Discovery*. LS advised that NOC was not able to match the comment against anything seen although it has occurred on the RRS *James Cook*. We can't replicate the noise on RRS *Discovery*. There isn't an identified 'electron noise problem' on *Discovery*. SF added that there was an issue identified but the cause isn't known. The way to find out what it is would be to undertake a testing. AH said that if there is a strong science driver to do this, we can put forward a business case to do this. We do need to justify it. MI asked that the CPRG to keep an eye on this. SF added that Dr Steve Boharty has just done an expedition and presumably this would have been picked up. RS added that BAS will be doing noise range on SDA, querying if this might be helpful for NOC, assuming the *Discovery* could be in the same place. Unfortunately, the ship will not be in the right place to do this. The conclusion was that no present or reproducible electronic noise problem is known to exist on *Discovery* at the present time.

10.2 Membership

Three years ago, we switched from six monthly meeting to annually. MI considered that the frequency of meetings is about right but perhaps it would be an idea to have the meeting over two days as this may enable opportunity for more input. RW suggested that if we have a meeting with large number of members next time, we may need extra time. MI added that useful connections are often made 'in the margins'. Perhaps the next meeting could include an evening component? LS suggested that it would be good to focus on the Technology Road Map, say 30 minutes on each section. In going through each section in this way, we can be certain that the drivers are

relevant? RL added that a Technology Roadmap workshop could feed back into the MFAB. RS suggested that we invite the community to comment on the roadmap. LS was pleased that WGs are being set up. CR suggested perhaps having a two hour session at the Challenger conference every two years? MI agreed that the TRM might benefit from input from a wider group. There is also the issue of new membership. Perhaps the next meeting should have an evening element as this may help initiate the new membership, when CR will be chairing. It was agreed to have start with an afternoon session, then an evening and then part of the next morning. AH said that when NOC has new members in the Science Directorate, they have a half day induction. It would be good to have something similar for new members of MFAB. MI volunteered to be part of this induction process. Induction is a good idea as it goes hand in hand with new membership. An invitation to the community to become members should be done with a month of this meeting. **Action: MI and Secretariat.**

- 10.3 KH suggested not having the meeting in Southampton, however, JP noted that when the MFAB had been held in Birmingham, physical attendees were NOC staff and Mike Webb from NERC. (*Post meeting correction: also attended: George Wolff, Chair, University of Liverpool, Bob Gatliff, BGS*)
- 10.4 KH Thanked NOC IT for the Skype link up as it had worked well. Thanks to be forward to Rob Jones, NOC IT.