Bluelink capabilities are world-leading in prediction of the upper ocean in priority areas including the Indo-Pacific-Southern Ocean domain. Bluelink forecast systems deliver fit-for-purpose atmospheric, wave and ocean forecasts to the Department of Defence at regional, shelf and littoral-scales, including user-initiated forecasts.

Bluelink
Ocean Forecasting

Strategic Plan 2025

Bluelink Strategic Plan 2025

Version 1.0: June 2019

1. Goal

Develop and maintain world-leading global, regional, and littoral ocean forecast systems to support Defence applications and maintain a national ocean forecasting capability for Australia.

2. Vision

Bluelink capabilities are world-leading in prediction of the upper ocean in priority areas including the Indo-Pacific-Southern Ocean domain. Bluelink forecast systems deliver fit-for-purpose atmospheric, wave and ocean forecasts to the Department of Defence at global, regional, shelf and littoral- scales, including user-initiated forecasts.

3. Objectives

1. Sustainment of world-leading global and high-resolution ocean-atmosphere-wave forecasts.
2. Enhance ocean forecasting capabilities through a portfolio of research and development activities.
3. Collaborate as strong partners in the ocean forecasting enterprise, to generate synergies from partner efforts and provide leadership for the benefit of Australia.

4. Scope

The Bluelink Partnership encompasses the Meteorological Services Agreement – Operational Sustainment of Ocean Forecasting Systems (MSA-OSOFS) between the BoM and Defence and the Collaborative Service Agreement (CSA) between BoM and CSIRO that forms the three-way partnership to deliver the foundational, sustainment activity; and a portfolio of research and development projects that improve existing capabilities and develop new capabilities for transition to a broader sustainment activity.

5. About the Partnership

Bluelink is a partnership between the Bureau of Meteorology, CSIRO, and the Department of Defence. It was initially established in 2001 with the goal of developing an operational forecasting system for the global ocean circulation around Australia. The Bluelink team continues to develop and enhance ocean forecasting capabilities for ocean circulation for global, regional and littoral scales.

The environment for naval operations – the ocean – is enormously complex, with constantly changing conditions. Without accurate forecasts, managing naval and maritime operations is a difficult task. To address this challenge, discussions began to develop the partnership in 2001, and established the first Bluelink project in 2003. The goal was to develop an operational ocean forecasting system and related tools to meet Australia's Defence needs.

Over the past 15 years, the Bluelink Partnership has delivered a world class ocean forecasting system, with quality assured through regular publications of the science under-pinning the work in peer-reviewed journals, showing that Bluelink forecasts are the best in the world on several fronts.

BoM and CSIRO priorities within the partnership include the sustainment of publicly-available global and regional-scale ocean-atmosphere-wave forecasts and targeted forecasting services for Defence. Defence priorities include sustainment of services to provide global and regional-scale ocean-atmosphere-wave forecasts in both an unclassified and a high-security and Defence-classified environment. The overlap of these priorities has led to the success and endurance of the Bluelink Partnership.

The three Bluelink partners will also identify institutions which contribute towards national ocean and marine capabilities. These institutions will be engaged as collaborating partners to compliment the Bluelink partner experience in development and sustainment of ocean forecasting services. The information about key collaborating partners is presented at Annex A.

6. Ocean Modelling

Ocean forecasting is concerned with the estimation of the current and near-future ocean state (composed of the ocean temperature, salinity and sea level), its motion, sea-ice, biogeochemistry, sediment and other water quality properties. This is achieved through the use of models (or system models) to estimate the change in these properties from some initial state and forced by the incident radiation, air-sea exchange and estuarine discharge. The initial state is defined by finding the best combination of model information and new observation information. The majority of observations are obtained from satellites that observe the surface properties of surface height, near-surface temperature and salinity and ocean colour. This is complemented by an array of autonomous profiling float and surface drifting buoys, moored buoys and expendable temperature profilers.

Global Modelling

Global ocean forecasting is undertaken by the US, UK, France, Australia, Canada, China and India forming an international community. An international science team, GODAE OceanView, meet annually to review progress and undertake collaborative work in Data Assimilation,

Inter-comparison and Verification, Observation Evaluation, Coupled Prediction, Coastal Prediction and Marine Ecosystems.

The Ocean Model, Analysis and Prediction System (OceanMAPS) represents the operational global ocean forecast system developed by the Australian Government under the Bluelink Partnership. The primary benefits of this national system are via contributions to the mission of each partner, support of Australia's Defence, provision of national ocean forecast information to the Australian community, and to support industry and scientific research. Australia has the third largest EEZ and is custodian to world heritage marine parks including the Great Barrier Reef. OceanMAPS provides an estimate for the recent past, present and near future conditions of the ocean temperature, salinity, sea level and currents that support a wide range of products and services for these applications.

The primary activities that are pursued under the MSA agreement to sustain the performance have been:

- Frequent introduction of new observing platforms (recent examples being Jason3 and VIIRS)
- Upgrading the atmospheric forcing to APSx changes in the operational NWP suite (recent example has been APS2 and 17/18 is planned APS3)
- Maintenance of the ocean modelling and data assimilation software
- Robustly monitor the forecast performance and comparison with other systems

All four activities remain critical to the sustainment of OceanMAPS over the next five years with some opportunities to extend beyond business as usual.

Regional Modelling

The Bluelink Partnership has provided for the development and deployment of the Relocatable Ocean Atmosphere Model (ROAM). This is a tactical level tool developed to forecast fine scale features possible in high resolution modelling, utilised to improve situational awareness in a variety of applications, particularly beneficial for predictions of sonar range in the ocean and radar range in the atmosphere. ROAM ingests OceanMAPS and ACCESS products to initialise and force each forecast.

Littoral Modelling

Littoral modelling under Bluelink has included the development of capabilities for the prediction of waves, currents and morphological changes in the littoral zone. Two systems are provided: the Littoral Ocean Modelling System (LOMS), which is capable of running on a laptop, and the ROAM-surf system which runs on a supercomputer. These systems provide the user with a surf zone model at a specific location and involves coupling the nearshore waves and currents, giving predictions of littoral conditions up to 5 days in advance.

7. Bluelink Infrastructure

Bluelink infrastructure consists of the following four foundational elements/components:

- Computing resource (prediction / assessment System)
- Data transfers (data management & monitoring)
- Observing systems
- Expert training

Specifically, all forecast services demand a high-level of compute resources, delivery of information requires secure, reliable, and fast data transfers from the source (e.g., HPC environment) to the field (e.g., RAN MetOcs and Defence decision-makers), specialised software for assimilating and modeling the ocean and are underpinned by observing systems that are publicly-available (e.g., satellite data, and Argo profiles). Environmental forecasting is increasingly moving towards ensemble prediction – delivering optimal use of observations, forecasts of scenarios, and estimates of forecast uncertainty (and probabilities). This shift is likely to increase the required compute resources and data transfer by two orders of magnitude or more. Sustainment of systems at state-of-the-art requires continued engagement with Australia's research sector (Universities), International research sector (GFDL, NOAA, UK Met Office), and continued expert training in relevant disciplines (e.g., environmental modelling, data assimilation). The quality of Bluelink services is vulnerable to changes in any of the above-mentioned foundational resources. Future-proofing Bluelink services against the degradation of any of these services will be a priority for the Bluelink Partnership.

Major changes in HPC architectures are expected during the next decade, with future HPC relying increasingly on accelerators with massive parallelisation. This will provide a key challenge for Bluelink as current models do not generally work on these platforms. Internationally there are major programmes to develop code bases that can support these new architectures including at the UK Met Office and ECMWF. This challenge will likely require the Australian marine modelling community to move to new model code bases in the mid 2020's. Such a move will be a complex task requiring several years of preparation, testing and optimisation, with a nationally coordinated approach.

8. Bluelink Partnership Delivery Pathways

The Bluelink Partnership, with support from collaborating partners, will sustain Australia's National global, regional, and littoral ocean forecast systems under the MSA-OSOFS to an agreed standard. Bluelink Partners will work with collaborating partners to further develop Australia's forecast capabilities – to better meet the needs of our Defence and Community stakeholders. These capabilities are delivered through the MSA Pathway, and a Pathway of Bluelink-Related Projects, as described below. More detail about each pathway is provided in Annex B – Bluelink Portfolio Roadmap.

MSA Pathway

Under the MSA-OSOFS, Bluelink Partners will deliver:

- two forecast systems:
  - Ocean Model Analysis and Prediction System (OceanMAPS – operated by the BoM to deliver public ocean forecasting services), and

  - Relocatable Ocean Atmosphere Model (ROAM[1] – operated by CSIRO to deliver user-initiated forecasts on a high-security platform), and
- one reanalysis system:
  - Bluelink ReANalysis (BRAN – operated by CSIRO and BoM to trial new developments, system vulnerabilities, and to provide information for strategic decision-making).

Additional systems may be transitioned to the MSA Pathway in the future.

Related Projects Pathway

Next generation tools and systems are developed under a suite of projects that aim either to improve the systems sustained under the MSA-OSOFS, or to create new systems or tools that can be transitioned into the MSA-OSOFS. Any related projects that contribute to achievement of the Bluelink goal may be transitioned to the MSA-OSOFS project, which may require additional funding.

9. Governance Structure and Bluelink Documents

Bluelink is governed by the Meteorological Services Arrangement – Operational Sustainment of Ocean Forecasting Systems (MSA-OSOFS) between the BoM and Defence and the Collaborative Service Agreement (CSA) between BoM and CSIRO. These are the Tier 1 documents.

The Bluelink management Committee (MC) has been established to govern the ten year (2015-2025) Bluelink initiative. The Terms of Reference are at Annex C. The Bluelink Operations and Development Committee (O&DC) has been established for the overall execution of the delivery and sustainment of ocean forecasting services and associated systems under Bluelink to agreed performance levels. The O&DC reports to the MC. The Terms of Reference are at Annex D and the KPIs at Annex E.

For the effective management and efficient forward planning for the duration of the MSA-OSOFS, this strategic plan and its five annexes have been developed. These documents are the Tier 2 documents. Some of these documents were already in existence, however, to improve the governance of Bluelink and the tracking of these documents, they have been grouped together as one set of documents. The aim of these documents is to give clear direction to the three partners on the intent and direction of the sustainment and development of Bluelink.

The Strategic Plan and its five annexes are the responsibility of the MC for maintenance and update. It is not expected that these documents will require regular update and thus are only to be reviewed and edited on exception.

The O&DC have the responsibility for the suite of documents that are the Tier 3 documents. These are the Annual documents, 5 Year Plan, Project Management Plan (PMP), Risk Register, Communications Plan and Document Templates. Many of these documents have the requirement for update or issue at the annual (or less) time frames and are thus reviewed and updated as required. This is outlined in the Project Management Plan.

This governance arrangement and document hierarchy is shown in Figure 1.

[1] ROAM includes ROAM-ocean, ROAM-atmos, ROAM-waves, and ROAM-surf – enabling user-initiated, regional-scale forecasts of the ocean, atmosphere, and littoral environment.

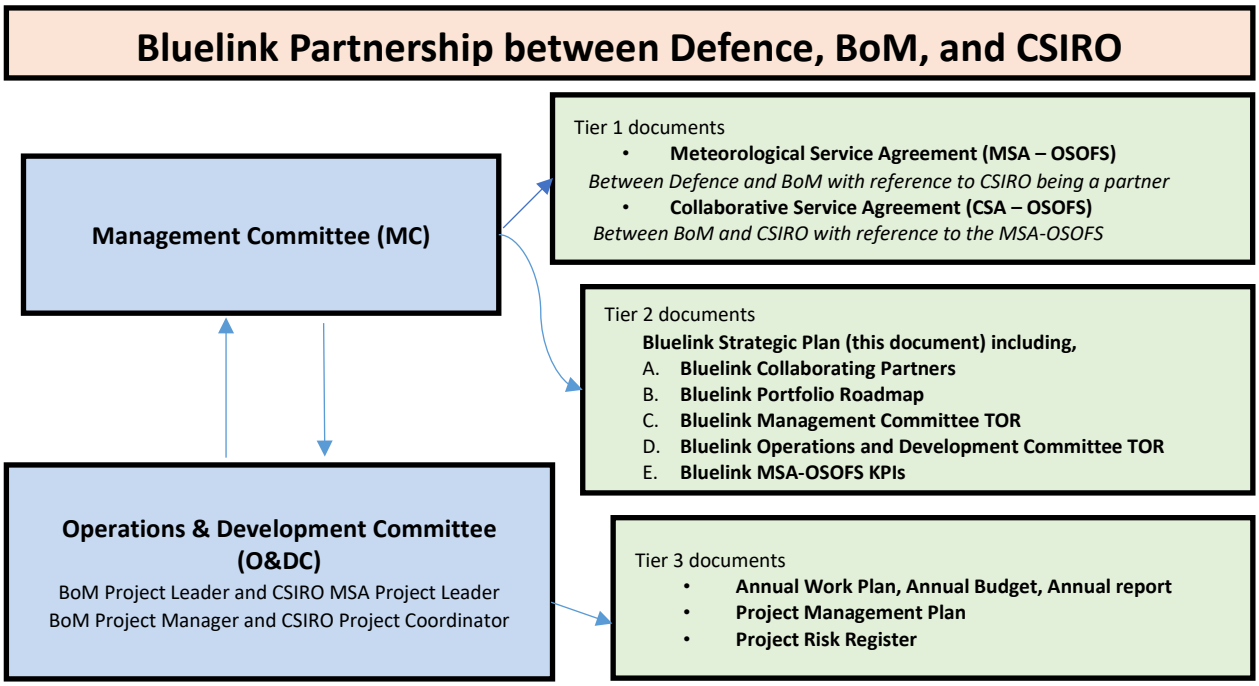

Figure 1. Bluelink Partnership Governance & Document Hierarchy

10. Communication and Stakeholder Engagement

Under this strategic plan, the partnership will establish and maintain appropriate communication activities (including website, conference presence, portfolio summary) to raise the profile of Bluelink and to recognise the Bluelink Partnership in establishing and maintaining National Capabilities in ocean forecasting and promoting collaboration.

Bluelink partners will maintain clear pathways for engagement with Collaborative Partners (including IMOS, DSTG and Universities) and Stakeholders (Industry, Government and the public). To date, successful engagement and collaboration has been achieved through annual Bluelink Science Meetings and with the numerous related projects. Effort will continue to be invested in these areas and others as opportunities arise.

The Bluelink members will develop a product access policy for OceanMaps and associated tools in order to meet anticipated growth of 3rd party requests. This is expected to be in line with existing BoM basic product set (BPS) policy. This requirement was identified due to growing third party interest in the capability, products and services currently available. There is also a desire to advance third party skills and capability through access to Australian ocean modelling.

11. Risk Management

The primary strategic risks have been identified as a degradation of any of the four foundational resources:

1. Compute Resource
2. Data Transfer
3. Observing System
4. Expert Training

Assessing and mitigating these risks is a priority for the Bluelink Partnership at all levels.

The O&DC shall identify, assess and manage risk as outlined in the PMP. The Project Leaders will oversee the maintenance of the Project Risk Register. The Project Risk Register will be reviewed and updated prior to every O&DC meeting or when a new risk is identified. The O&DC will report to the MC any significant change to the Risk Register, or any newly identified risk.

Strategic Plan 2025 Document Structure

Annexes

Bluelink Collaborating Partners

Collaborating Partners

Besides the three Bluelink partners, there are crucial collaborating partners which are IMOS, DSTG, NCI, and the University sector. BoM and CSIRO's extensive experience in the development and sustainment of ocean forecasting services is complimented by each of the Collaborating Partners, who deliver critical support to Bluelink partners.

IMOS

The Integrated Marine Observing System (IMOS) is a national, collaborative, research infrastructure funded by the Australian Government. The IMOS Research Infrastructure aims to provide systematic and sustained observing of the marine environment with open data access for scientific research and other purposes.

IMOS provides substantial in-kind co-investment to the Bluelink portfolio. IMOS continuously seeks uptake and use of its observations and data so as to deliver relevance and impact to the Department of the Defence. IMOS is led by UTAS and has CSIRO and Bureau of Meteorology, as partners, so there is strong overlap with the Bluelink initiative. IMOS is measuring physical, chemical and biological variables, from open-ocean onto the continental shelf and into the coast. As such it provides ample opportunity for alignment with the Bluelink portfolio research interests.

With a clear focus on data stewardship and open data access, IMOS ensures that observations funded for science and research can be used and reused for other purposes, including operational oceanography. This increases the return on taxpayer investment in IMOS. IMOS invests heavily in observations and data relied on by Bluelink, this includes:

- Argo profiling floats
- Ship of Opportunity (SOOP) measurements (including expendable bathythermographs)
- Deep water moorings
- HF Radar
- Ocean Gliders
- Satellite oceanography (including calibration and validation and national products for altimetry and SST)

DST Group

Defence Science and Technology Group (DST Group) Maritime Division have provided expert advice for the acoustic applications of Bluelink. Under the DST Group Future Undersea Warfare strategic research project, DST Group is collaborating with Navy, BoM and CSIRO to assess and improve Bluelink environmental predictions relevant to sonar performance and sonar performance modelling. A set of environmental features which control acoustic propagation has been identified

and used with OceanMAPS and ROAM model predictions to compare modelled features with observations. Work is proceeding to determine the sensitivity of sonar performance to these features, identify the sources of error, and make improvements to the models that fall within the scope of the project. Future work is proposed to examine using acoustic propagation loss as a performance metric, and to examine forecast uncertainty, and the use of data assimilation to help reduce both uncertainty and errors.

NCI

The delivery of Bluelink is undertaken with the assistance of resources and services from the National Computational Infrastructure (NCI), which is supported by the Australian Government. Based at the Australian National University, NCI provides integrated high-performance computing and high-performance data services to more than 4,000 researchers at a number of the national science agencies, including the CSIRO and BoM. NCI is home to the nation's fastest supercomputer, its highest-performance research cloud, its fastest filesystems and its largest research data repository.

Universities

Numerous Universities across Australia have impacted the Bluelink partnership and research. Their expert training and collaborative development enable the delivery, sustainment, and improvement of Bluelink services. Primary universities that have contributed are University of NSW, University of Tasmania, University of WA and Australian National University.

Bluelink Portfolio Roadmap

(updated May 2019)

MSA Pathway

Activities / Projects	2019	2020	2021	2022	2023	2024	2025
OceanMAPS							
ROAMs							
Remote-ROAM							
Global Model upgrade							
ROAM-Biovis							
Enhanced ROAM-surf							
Global coupled prediction							
ADEPT							
GEP							

Related Projects Pathway

Activities / Projects	2019	2020	2021	2022	2023	2024	2025
Remote ROAM Development							
Ocean Atlas Development							
Global Model development							
Acoustics assessment							
ROAM-Biovis Development							
Next Gen Littoral prediction (Enhanced ROAM-surf Development)							
ADEPT development							
Global ensemble prediction (GEP)							

KEY

- funded under MSA-OSOFS
- May require additional funding to be incorporated into the MSA-OSOFS
- funded development
- proposed development

Since 2007, Bluelink has provided public services. Starting in 2019, Bluelink will also provide classified services (through Remote ROAM).

	2007-2013	2014-2018	2019-2023	2024-
Public services				
Classified services				

Current MSA Activities

Activities are undertaken under the MSA by Bluelink partners. Current activities include:

- The core MSA-OSOFS activities aim to sustain publicly-available OceanMAPS services and ROAM services to an agreed standard for Defence (expected effort: ~80%). The current core activities include:
    - Implementation of OceaMAPS3.2 (KPI-1.4);
    - Delivery of ROAM @ CSIRO (KPI-2.1);
    - Development of automated forecast error alerts within ROAM to alert users of the possibility that forecast skill may be degraded, e.g., due to missing observations or chaotic/unpredictable ocean circulation (KPI-2.3); and
    - Automated surf-zone reports (KPI-2.1);
- Other MSA-OSOFS activities aim to further improve capabilities (expected effort: ~20%, depending on the availability of resources after core sustainment requirements are addressed). The current additional activities include:
    - Developments towards global optimal data assimilation and ensemble forecasting (KPI-1.4);
    - Undertake observing system evaluations, including Argo, Himawari-8, and SWOT (KPI-2.1); and
    - Monitor international research in coupled weather prediction (KPI-1.4 and 2.3).

Related Activities

The related activities and projects listed here are developments that are funded outside of the MSA-OSOFS, and that are intended to be incorporated into the suite of services under the MSA. Current funded and proposed Bluelink-related projects include:

- Delivery of Remote ROAM; **Funded**: Defence and CSIRO funding; (extending KPI-2.3 to deliver services in the field, with limited, or no, connectivity);
- Development of Ocean Atlas; **unfunded**: DSTG and CSIRO funding on hold; (potentially extending KPI-1.4 & 2.3, to deliver offline databases relevant to tactical decision-making in the field);
- Adoption of a new "truly global" community ocean model, including sea-ice; Model development and assessment is **funded**: Defence, BoM, AAD, CSIRO, ARC funding to COSIMA linkage project; extending the scope of KPI-1.1 and 1.4, to include high latitudes and sea-ice);
- Assessment of ROAM acoustic predictions; **Funded:** DSTG and CSIRO funding; (extends KPI-2.3);
- Verification of sonar prediction in OceanMAPS; **Funded** DSTG; (extension of KPI1.4);
- Assessment of ROAM-Ocean acoustic properties; **Funded** DSTG; (extension of KPI 2.3);
- Development of Bio-ROAM, including development of global biogeochemical forecasting (proposal submitted to Defence March 2019), to facilitate user-initiated forecasts of bioluminescence potential and water clarity; **unfunded**; (extends KPI-1.4 and 2.3, includes BGC);
- Development of enhanced forecast capabilities to support amphibious operations; Enhanced ROAM-surf; (Proposal submitted to Defence March 2019) **unfunded**; (KPI-2.1, to establish fit-for-purpose forecasts of littoral conditions);
- Development of a global coupled ocean-wave-sea-ice model and forecast system; **unfunded**; (extends KPI-1.4); and
- A suite of high resolution regional nested atmosphere-wave-ocean prediction tiles: ADEPT; **unfunded**; (extends KPI-1.4). (A pilot of this project was delivered under the MSA-OSOFS 2018/2019 , however, in future, such developments would normally be undertaken outside of the MSA-OSOFS).
- Development of global ensemble ocean forecasting; **unfunded**; (extends KPI 1.4).

Bluelink Management Committee
Terms of Reference

Purpose

1. The Bluelink Management Committee (MC) is convened to govern the ten year (2015-2025) Bluelink initiative.

Terms of Reference

2. The MC functions will be to:
   - 2.1. Provide high-level strategic advice and direction to ensure that the activities undertaken are pursuant to the MSA.
   - 2.2. Review the activities being undertaken pursuant to the MSA, including annual review.
   - 2.3. Approve the Annual Work Plans and the multi-year Roadmap.
   - 2.4. Endorsement of Projects developed and sustained within the Bluelink Environment.
   - 2.5. Adjudicate and resolve matters brought forward.
3. When a decision is required, a consensus must be achieved to ensure that any decision made can be implemented within all the organisations.
4. The MC will meet as necessary but at no greater interval than six (6) months.
5. The MC will meet at fixed intervals, wherever possible, two months following the Operations and Development Committee (O&DC) nominally May and December of each year.
6. The Agenda will be disseminated 14 days prior to the MC meeting and will include the following standing items:
   - 6.1. Minutes and Actions from previous meeting;
   - 6.2. Outcomes of O&DC Committee;
   - 6.3. Report from Defence on current/future focus and priorities;
   - 6.4. Finance report from the Bureau;
   - 6.5. Finance report from CSIRO;
   - 6.6. Review and Approval of next FY Annual Work Plan (May only);
   - 6.7. Review previous FY reports (Dec only);
   - 6.8. Other business.
7. Minutes of the meeting will be prepared, and are to include an annex for Decisions and Action Items. A draft version will be circulated to all attendees, ideally within two weeks of the meeting. The final minutes will be registered after receiving the feedback from the attendees and approval from the Co-chairs.

Membership of the Management Committee

8. The MC will consist of up to three appointees from each of the Bureau, Defence and CSIRO as specified below. The Bureau and Defence will provide Co-chairs for the MC. Any change to the member nomination must be made in writing by the relevant partner to the Co-chairs of the MC.

Organisation	**Role or Affiliation**	
Bureau of Meteorology	General Manager, National Security Program	Co-chair
	General Manager, Science to Services Program	
	National Manager, Weather and Marine Forecasts	
Defence	Director Military Geospatial Program	Co-chair
	Deputy Director Military METOC Program	
	Commanding Officer Maritime Geospatial Warfare Unit	
CSIRO	Deputy Director, CSIRO Oceans and Atmosphere	
	Research Group Leader, Oceans, Climate Science Centre, CSIRO Oceans and Atmosphere	
	Project Leader Bluelink MSA, Climate Science Centre, CSIRO Oceans and Atmosphere	

9. Secretariat support for the Management Committee will be provided by:

   Ocean Analyst, National Forecast Services

10. The Chair of the O&DC is a member of the MC for the purposes of reporting on the O&DC. If the Chair is unavailable to attend the MC, the Chair is to appoint a representative from the O&DC to represent at the MC. The Project Leaders from the Bureau and CSIRO are invited to attend the MC as Observers.

11. Observer attendance at MC meetings is at the discretion of the Co-chairs. Observers must be nominated by a member, in writing, to the Co-chairs of the MC for approval no later than two weeks prior to the meeting.

Bluelink Operations and Development Committee Terms of Reference

Purpose

1. The Bluelink Operations and Development Committee (O&DC) is convened to be responsible for the overall execution of the delivery and sustainment of ocean forecasting services and associated systems under Bluelink to the agreed performance levels.
2. The committee reports to the Bluelink Management Committee (MC).

Terms of Reference

3. The O&DC functions will be to:
   - 3.1. Ensure the implementation and delivery of ocean forecasting services and associated systems meets agreed key performance indicators (KPIs).
   - 3.2. Develop and maintain a multi-year Roadmap for approval by the MC.
   - 3.3. Develop Annual Work Plans for feedback and approval by the MC.
   - 3.4. Advise and make requests to the Management Committee on any significant work plan decisions, and/ or proposals and/ or changes to resourcing requirements needed to meet agreed service delivery.
   - 3.5. Develop and maintain the Project Management Plan (PMP) which will form the basis for management and assessment of project overall success.
   - 3.6. Provide written Annual Reports for the MC on service performance and system developments.
   - 3.7. Promote and ensure effective coordination between the partners.
   - 3.8. Coordinate liaison with Defence on service and system sustainment and associated developments.
   - 3.9. Develop and define KPIs for monitoring performance of services and associated systems for approval by the MC.
   - 3.10. Manage system maintenance required to deliver agreed services to agreed performance and timing requirements.
   - 3.11. Manage user feedback on performance and utility of services.
4. The O&DC will meet as necessary but at no greater interval than six (6) months.
5. The O&CD will meet at fixed intervals, to meet the annual reporting requirements, nominally March and October of each year. Where required, the Chair can call an out of session O&DC meeting.
6. The Agenda and meeting (discussion) papers will be disseminated at least one week prior to the O&DC meeting.
7. Two co-rapporteurs, one each from the Bureau and CSIRO will prepare minutes of the meeting. The project manager will circulate draft minutes to all attendees for review, ideally within 3 days of the

meeting. The final minutes will be registered after receiving the feedback from the attendees and approval from the Chair.

Membership of the Operations and Development Committee

8. The O&DC will consist of up to four appointees from each of the Bureau, Defence and CSIRO as specified below, which includes the Bureau and CSIRO Project Leaders. The Bureau will provide the Chair of the O&DC. Any change to the member nomination must be made in writing by the relevant partner to the Chair of the O&DC.

Organisation	**Role or Affiliation**	
Bureau of Meteorology	MSA-OSOFS Project Leader / National Manager Ocean Services	Chair
	MSA-OSOFS Activity Leader / Science to Services - Ocean Prediction Team Leader	
	MSA-OSOFS Activity Leader / National Operations Centre - Supervisor Oceanographic Systems	
	MSA Project Manager	
Defence	SO2 Plans Maritime Geospatial Warfare Unit	
	Staff Officer METOC Policy and Plans	
	TBA	
	TBA	
CSIRO	Project Leader Bluelink MSA / Climate Science Centre, CSIRO Oceans and Atmosphere	
	MSA-OSOFS Activity Leader	
	Research Group Leader, Oceans, Climate Science Centre, CSIRO Oceans and Atmosphere	
	MSA Project coordinator	

9. The Chair of the O&DC is a member of the MC for the purposes of reporting on the O&DC. If the Chair is unavailable to attend the MC, the Chair is to appoint a representative from the O&DC to represent at the MC. The Project Leaders from the Bureau and CSIRO are invited to attend the MC as Observers.

10. Observer attendance at O&DC meetings is at the discretion of the Chair. Observers must be nominated by a member, in writing, to the Chair of the O&DC for approval no later than one week prior to the meeting.

Working Parties and Task Teams

11. Working Parties and Task Teams may be established by O&DC from time to time to address specific issues as required, for a specified time and purpose, being careful to minimise costs where possible.
12. Chairs of Working Groups and Task Teams will report to the OD&C and may be asked to attend O&DC meetings as Observers.

Bluelink MSA-OSOFS KPIs

(updated December 2017)

1. Global Ocean Forecasting System & Related Services

KPI-1.1: Service availability: Ocean Model Analysis and Prediction System (OceanMAPS[1]) provides daily global forecasts of sea level, currents, ocean temperature and salinity according to model specifications.
Metric: Number of days OceanMAPS produced and disseminated a forecast (target = 99%).

KPI 1.2a: Response to unplanned outages: Operation of OceanMAPS[1], AUSWAVE, NWP and data access facilities (e.g., ROAM ftp and OpenDAP server) monitored by BoM, with a response[2] to operational interruptions and advice provided to users (RAN & ROAM developers) within six hours.
Metric: Outage response times (target = 95% are provided within required timeframes).

KPI 1.2b: Restoration of services following any service outage: The operation of OceanMAPS, AUSWAVE, NWP and data access facilities (e.g., ROAM ftp and OpenDAP server) are resumed within 1 day following any outage.
Metric: Service resume times (target = 95% service resumption within 1 day)

KPI-1.3: Notification of planned interruptions to service and system upgrades: All necessary changes to systems that will cause an interruption to global or regional forecast services are planned in advance and in consultation with users with a minimum of 30-day's notice.
Metric: Notification times for planned service interruptions and system upgrades (target = 100% of notifications with minimum of 30-day's notice).

KPI-1.4: Forecast skill: Skill of OceanMAPS[1] forecasts and analyses are on par with international standards.
Metric: Forecast error (target = performance is equal to, or better than, Bluelink-III performance and within the median range of recognised international comparable models).

2. Relocatable Forecasting Systems and Services

KPI-2.1: Service availability: ROAM[3] provides on-request forecasts of the atmosphere, sea-level, currents, waves, ocean temperature, salinity, and littoral conditions for user-selected nested domains according to model specifications.
Metric: Number of days ROAM was available to produce a forecast (target = 95%).

[1] 2015 version of OceanMAPS has 1/10 degree near-global resolution (except Polar Regions).

[2] Action has been taken (e.g. the on-call person from BoM has been notified and has started resolving the problem)

[3] 2015 version of ROAM permits forecasts of the Ocean with 2 km resolution, Atmosphere with 5 km resolution, and waves with 2 km resolution.

KPI-2.2: Response to outages[4]: ROAM operations and dependencies are monitored so that ROAM outages are detected, communicated to RAN and Bureau, and operations resumed within one business day.
Metric: Outage response times (target = 95% are provided within required timeframes) and documented post-outage report delivered to the O&DC.

KPI-2.3: Forecast Skill: ROAM operates with no unexplained degradation of forecast skill, without a forecast error alert, and default model set-ups delivered under ROAM reflect the current best practice[5].
Metric: Forecast error (target = no unexplained degradation of forecast skill, without a forecast error alert)

KPI-2.4: Notification of planned interruptions[6] to service: All planned interruptions to services that will degrade or disrupt ROAM forecast systems are planned in advance and in consultation with Defence users.
Metric: Notification times for planned service interruptions and system upgrades (target = 100% of notifications with minimum of 30-day's notice).

KPI-2.5: Notification of urgent, unplanned interruptions[7] to service: All urgent, unplanned interruptions to services that will degrade or disrupt ROAM forecast systems will be announced to Defence users as soon as practical, and will be agreed in consultation with Defence.
Metric: Notification times for urgent, unplanned service interruptions (target = 100% of notifications on the same working day as the interruption is scheduled[8]).

3. Specialised Advice

KPI-3.1: Advice: Support services and advice delivered as specified in Annual Work Plans.
Metric: Time to provide initial response to RAN requests (target = within 2 business days); Delivery partners meet with Defence partners a minimum of 6 times per year, with at least two of these being face-to-face meetings.

[4] For example, a system failure without notice, a planned system upgrade, or an urgent, unplanned security patch.
[5] CSIRO researchers deploy ROAM components routinely, and regularly optimise the model configuration for different regions to yield optimal performance.
[6] For example, routine system upgrades or upgrade to ROAM system.
[7] For example, urgent security patch.
[8] Expected to be as soon as the ROAM team become aware of the need for the urgent, unplanned interruption.