

**POLLUTION PREVENTION MANAGEMENT MANUAL  
POLLUTION PREVENTION GUIDELINE  
FIREFIGHTING FOAM MANAGEMENT**

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**Sponsor**

Directorate of Environment and Heritage Policy Development

**Developer**

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**Issued by**

Alison Clifton with the authority of Assistant Secretary Environment and Engineering Branch

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**AMENDMENT CERTIFICATE**

Proposals for amendment of **ANNEX 1C** of the Pollution Prevention Management Manual are to be forwarded to:

Director of Environment and Heritage Policy Development  
Environment and Engineering Branch  
26 Brindabella Circuit  
Department of Defence  
CANBERRA ACT 2600

<b>Amendment number</b>	<b>Section(s)</b>	<b>Amendment</b>	<b>Effectuated date</b>
1	Whole document	Remove reference to DEF (AUST) 5706 - Foam, Liquid Fire Extinguishing; 3% and 6% Concentrate Specification	
2	Appendix 1C-A	Addition of procurement advice	
3	Paragraph 21	Deleted	
4	Requirement 1C1.18 to 1C1.27	Aligned with PFAS NEMP and current best practice	

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5	Requirement 1C1.26	Deleted – Repeat of 1C1.17 - 1C1.22	
6	Requirement 1C.1.21	Aligned with updated analytical guidance	
7	Requirement 1C.1.3 – 1C.1.15	Added advice on DCP as a Class A Fire product.	
8	Requirement 1C.1.17 and 1C.1.21	Added advice on re-use of water	December 2021
9	Paragraph 25.a., Requirement 1C.1.3	Added requirements for the procurement of foam for land based fixed systems	December 2021
10	Requirement 1C.2.8	Added requirement to review environmental performance of ARFF foam storage, testing and training facilities	December 2021
11	Whole Document	Updated to reflect incorporate of Fluorine Free Foams on the Defence Estate	December 2021

### ACRONYMS AND ABBREVIATIONS

<b>AFFF</b>	Aqueous Film Forming Foam
<b>ANZECC</b>	Australian and New Zealand Environment and Conservation Council
<b>ARMCANZ</b>	Agriculture and Resource Management Council of Australia and New Zealand
<b>AS</b>	Australian Standards
<b>AST</b>	Above-ground Storage Tank
<b>BFFF</b>	Bushfire Fighting Foam
<b>BSSC</b>	Base Services Support Centre
<b>CASG</b>	Capability Acquisition and Sustainment Group
<b>CEMP</b>	Construction Environmental Management Plan
<b>CFI</b>	Capital Facilities and Infrastructure
<b>CI</b>	Continual Improvement
<b>CSR</b>	Contaminated Site Register
<b>Defence</b>	Department of Defence
<b>DCARM</b>	Directorate of Contamination Assessment and Remediation Management
<b>DCP</b>	Dry Chemical Powder
<b>DEQMS</b>	Defence Estate Quality Management System
<b>DEWPO</b>	Directorate Estate Works Program Office
<b>DFI</b>	Defence Fuel Installation
<b>ECC</b>	Environmental Clearance Certificate
<b>EE</b>	Environment and Engineering
<b>EFM</b>	Environmental Factor Management
<b>EMP</b>	Emergency Management Plan
<b>ESD</b>	Ecologically Sustainable Development
<b>ESM</b>	Environment and Sustainability Manager
<b>E&amp;IG</b>	Estate and Infrastructure Group
<b>F3</b>	Fluorine Free Foam
<b>HDPE</b>	High Density Polyethylene
<b>GEMS</b>	Garrison Estate Management System
<b>LOCR</b>	Legal Obligations and Compliance Register
<b>MEOMS</b>	Mechanical Equipment Operations and Maintenance Section
<b>MFPE</b>	Manual of Fire Protection Engineering
<b>NWC</b>	National Waste Contractor
<b>NEPC</b>	National Environment Protection Council
<b>NEMP</b>	National Environmental Management Plan

## Pollution Prevention Guideline Annex 1C – Firefighting Foam Management

<b>ODSC</b>	Office of Defence Special Counsel
<b>PBT</b>	Persistent, Bioaccumulative and Toxic
<b>PDS</b>	Project Delivery Services
<b>PFAS</b>	Per- and polyfluoroalkyl Substances
<b>PFOA</b>	Perfluorooctanoic Acid
<b>PFOS</b>	Perfluorooctane Sulfonate
<b>POP</b>	Persistent Organic Pollutant
<b>PPMM</b>	Pollution Prevention Management Manual
<b>RAAF</b>	Royal Australian Air Force
<b>RAN</b>	Royal Australian Navy
<b>SDS</b>	Safety Data Sheet
<b>SOP</b>	Standard Operating Procedure
<b>TWA</b>	Trade Waste Agreement
<b>UST</b>	Under-ground Storage Tank
<b>WHS</b>	Work Health and Safety
<b>WOL</b>	Whole-of-life
<b>WWTP</b>	Wastewater Treatment Plant
<b>µg/L</b>	Micrograms per litre

## **BACKGROUND**

1. The Department of Defence (Defence) is required, where possible, to prevent pollution resulting from Defence activities, thereby reducing waste and potential impacts to the environment.
2. Defence is required to store and use firefighting foams (foams) for a range of firefighting purposes across the estate. Defence uses a range of foam products for Class B (flammable liquids) fires, bushfires and other Class A (combustible solids) fires, as well as training foams for firefighting training purposes.
3. This Pollution Prevention Guideline refers to activities associated with foam management on the Defence estate. Foams specifically covered in this Guideline include:
  - a. Aqueous Film-Forming Foams (AFFF) and other fluorinated foams
  - b. Other Class B foams such as alcohol resistant AFFF (AR-AFFF), fluorine-free and re-healing foam
  - c. Bushfire Fighting Foams (BFFF)
  - d. Training foams.
4. This Pollution Prevention Guideline also provides guidance on the management of complimentary firefighting agents such as Dry Chemical Powder (DCP).
5. Defence's foam stocks include fluorinated foams which have been and are still used extensively to meet minimum capability requirements to prevent and extinguish fires involving flammable liquids such as petroleum, oil or paint (Class B fires).
6. The storage and handling of flammable liquids is critical for Defence capability. The storage and handling of foams suitable to extinguish Class B fires in particular, assists to protect the health and safety of Defence personnel and the protection of the Defence estate including infrastructure and equipment.
7. Foam products contain mixtures of different chemical substances. These chemical substances include surfactants, solvents, foam stabilisers and corrosion inhibitors. Surfactants, or surface-active agents, are chemical substances that can act as detergents, wetting agents, emulsifiers, foaming agents and dispersants.
8. Foam products used in maritime platforms or vessels may have different formulations and specifications to foam products used for other Defence activities. The Royal Australian Navy (RAN) AFFF Policy and Procedures (Ref LL) outlines the environmental requirements for AFFF used by RAN. Environmental considerations outlined in this Guideline must be considered by RAN, where they directly relate to a RAN activity or the Defence estate.

## **ENVIRONMENTAL ISSUES**

9. All foams can cause a level of harm to the environment if released. The necessity to use foams to protect human health, Defence capability and

infrastructure, and the environment outweighs the risks to the environment from emergency discharge of foams and use of training foams to ensure personnel are adequately prepared for firefighting response.

10. The **Potential Firefighting Foam Pollutants** and the **Pollutant Fate and Transport** sections of this Guideline describe the effects of foams on the environment.

11. AFFF, AR-AFFF, fluoro-protein and similar foam formulations usually contain per- and polyfluoroalkyl substances (PFAS), and are commonly referred to as fluorinated foams. Historically AFFF formulations may have included fluorosurfactants, primarily long-chain PFAS such as perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA). Modern foam formulations have transitioned from the use of long-chain PFAS as primary (active) ingredients due to their bioaccumulative characteristics, and the lower toxicity of short chain PFAS.

12. Fluorine-free Class B foams are available that do not contain fluoro-surfactants, however, these foams can still present a risk to the environment if not managed appropriately.

13. Even where concentrations of long-chain PFAS in foams have been reduced, the potential remains for Class B foams to include measureable amounts in the supplier provided stock either through trace impurities in the product formulation, cross-contamination or breakdown of other PFAS. Thresholds for allowable impurities are included in some instruments such as the Queensland Foam Policy. Cross-contamination can also occur when using newer formulations of foams in infrastructure that may have been contaminated by the use of historical AFFF products.

14. The environmental risks for the use of all types of foams, including F3 products, training foams and BFFF must be considered prior to procurement and use. All foams can cause environmental harm due to toxicity from non-PFAS components and depletion of oxygen in waterways. Refer to the environmental criteria for comparing firefighting foam products contained in **Appendix 1C.B** for additional information.

15. Complimentary firefighting agents such as dry chemical powder (DCP) should be managed in accordance with the product directions and requirements included in this Annex in order to mitigate release to the environment in non-emergency situations.

### **GUIDELINE REQUIREMENTS AND PERFORMANCE STANDARDS**

16. This Guideline has been developed to assist Defence personnel and contractors in the environmentally sound management of foams. It takes a Whole-of-Life (WOL) approach from considering procurement issues to disposal processes.

17. It is intended that the pollution prevention initiatives outlined in this Guideline should be incorporated into relevant Defence and Defence contractor operating procedures and business processes.

18. This Guideline includes a nationally consistent approach for facility managers to minimise risks by proactively managing foams in accordance with the legislative framework and leading practices being applied to Australian industry.

19. The content of this Guideline is not intended to be detailed and prescriptive and must be read in conjunction with the documents outlined in the **Regulatory Requirements** section of this Guideline and relevant Australian Standards (AS).
20. This Guideline does not provide information regarding the management of contaminated land or the performance requirements of foams used in relation to Defence activities or on the Defence estate.
21. Foam users must follow the procedures and guidance outlined in the product instructions and safety data sheet (SDS), as well as this Guideline.
22. Roles and Responsibilities for implementation of this Guideline are outlined in Chapter 2 of the Defence [Pollution Prevention Management Manual \(PPMM\)](#) (Ref Q).
23. The simplest way to prevent pollution is to avoid or reduce the source of potential pollutants. Source reduction can be achieved in many different ways, including identifying more environmentally responsible products in the procurement phase, efficient storage and handling practices, handling of foams in closed systems, using more sustainable equipment and processes, and reducing the volume of stored products.
24. Information on integration of Ecologically Sustainable Development (ESD) principles within Defence can be found in the Defence [Smart Infrastructure Handbook](#) (Ref M).
25. If there is any doubt regarding the requirements and performance standards set out in this Guideline, guidance should be sought from zone Environment and Sustainability Managers and / or the Environment and Engineering (EE) Branch of the Estate and Infrastructure Group (E&IG).
26. The performance standards discussed in this Guideline include the following key areas where compliance is required:
  - a. **Procurement:** Consideration of the environment must be included in procurement decisions for all foams and complimentary firefighting agents. Substitute fluorinated foams (foams containing PFAS) with fluorine-free Class B foams.
  - b. **Management and Administrative Controls:** Foam storage and handling facilities must comply with supporting documentation requirements, inspections and management reviews required by this Guideline, applicable legislation and Australian Standards.
  - c. **Design of New Facilities:** Design and installation of facilities must be undertaken by appropriately qualified and experienced professionals, using best practice techniques and pollution prevention design requirements. Well-designed facilities will ultimately lower Defence's environmental risk.
  - d. **Drainage Systems:** Reduce contamination by containing and preventing runoff from storage and handling areas. Drainage systems must comply with maintenance and monitoring requirements, and appropriately manage pollution risks associated with the discharge of chemicals, water and foam to



stormwater or sewer, as outlined within applicable legislation and Australian Standards.

- e. **Treatment and Disposal:** The treatment and offsite disposal of foam wastewater and other firefighting waste products must comply with requirements outlined within applicable State and Territory legislation, where relevant.
- f. **Emergency Response and Clean-Up:** Emergency response and clean-up procedures, actions and reporting for foam / liquid waste handling activities must comply with requirements outlined within applicable legislation and AS.

27. Defence specific requirements for the management of firefighting foam and complimentary firefighting agents are included in **Table 1C.1**.

**Table 1C.1: Requirements for Firefighting Foam Management**

Seq	Requirement	Description	Stakeholder with potential roles or responsibilities
<b>Waste Minimisation</b>			
1C.1.1	Minimise the production of foam and foam wastewater.	<p>Follow the waste minimisation hierarchy (prevention, minimisation, re-use, recycle, energy recovery, and landfill) where practicable in prioritising initiatives.</p> <p>Avoid any unnecessary production of foam and foam wastewater and combine polluting activities, where possible, to allow for mutual capture points. Examples include:</p> <ul style="list-style-type: none"> <li>• Undertake training activities with water or training foam only</li> <li>• Use minimum amount of foam required for system / equipment testing</li> <li>• Reduce frequency of system / equipment testing to meet capability requirements</li> <li>• Identify any potentially polluting activities that can be undertaken at a better equipped facility</li> </ul>	<p>Facility Service Delivery Personnel (Contracted / Military / Civilian)</p> <p>Procurement Personnel / Supply Change Managers</p> <p>Design Personnel</p> <p>Site / Base Manager</p> <p>Environment and Sustainability Managers</p>
1C.1.2	Consider ESD in the design and construction of all new firefighting foam storage and handling facilities.	Requirements for ESD are included in the Defence <a href="#">Smart Infrastructure Handbook</a> (Ref M), which states that all facility and infrastructure designs shall aim to promote recycling, re-use and reduced disposal of waste-to-landfill in the construction, operation and decommissioning stages of the infrastructure lifecycle.	<p>Facility Service Delivery Personnel (Contracted / Military / Civilian)</p> <p>Procurement Personnel / Supply Change Managers</p> <p>Design Personnel</p>
<b>Procurement</b>			
1C.1.3	Only procure foams that meet capability and environmental requirements.	<p><u>ALL FOAMS</u></p> <ul style="list-style-type: none"> <li>• Foam products must be fit for purpose and meet Defence capability requirements.</li> <li>• Foams are to be procured and used for their intended purpose only.</li> </ul>	<p>Site / Base Manager</p> <p>Facility Service Delivery Personnel (Contracted / Military)</p>

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Seq	Requirement	Description	Stakeholder with potential roles or responsibilities
	Do not procure foams that contain PFOS, PFHxS or PFOA as active ingredients.	<ul style="list-style-type: none"> <li>• Foams containing PFOS, PFHxS or PFOA as active ingredients must not be procured.</li> <li>• Foams containing PFAS must not be procured for new land based fire suppression systems. Any new-build design, which at the time of release of this updated Annex has not yet reached the 30% detailed design stage, which must have a dedicated foam system, must strictly be designed for the use of F3 only. Other alternatives to firefighting foams can be explored if they meet the requirements for asset protection.</li> <li>• Provision of environmental data set out in <b>Appendix 1C.B</b> must be incorporated into procurement contracts with suppliers.</li> <li>• Where multiple products meet capability requirements, the environmental data set out in <b>Appendix 1C-A</b> must be compared by an appropriately qualified person, prior to the procurement being finalised, to ensure the foam product with the least environmental impact is procured. EE Branch can be contacted for support at <a href="mailto:pollution.prevention@defence.gov.au">pollution.prevention@defence.gov.au</a></li> </ul> <p><u>CLASS B FOAMS</u></p> <ul style="list-style-type: none"> <li>• Class B foam products must meet the relevant Defence Group or Service capability requirements (Ref HH).</li> </ul> <p><u>ARFF FOAMS</u></p> <ul style="list-style-type: none"> <li>• In accordance with E&amp;IG Directive – <a href="#">INTRODUCTION INTO SERVICE DIRECTIVE FOR BIO-EX ECOPOL-A IN ARMY, AIR FORCE AND CONTRACTED AIRCRAFT RESCUE &amp; FIREFIGHTING VEHICLES</a>, Bio-Ex Ecopol A, a fluorine-free foam product, must be used in all Army, Air Force and contracted ARFF vehicles.</li> </ul> <p><u>TRAINING FOAMS</u></p> <ul style="list-style-type: none"> <li>• Training foams must not contain fluoro-surfactants i.e. PFAS.</li> </ul> <p><u>BFFF</u></p>	/ Civilian) Contract Managers Groups and Services EE Branch

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Seq	Requirement	Description	Stakeholder with potential roles or responsibilities
		<ul style="list-style-type: none"> <li>• BFFF products must meet capability requirements.</li> <li>• Phosphate-free BFFF must be procured, where they meet capability requirements.</li> <li>• BFFF products must not contain fluoro-surfactants i.e. PFAS.</li> </ul>	
1C.1.4	Where multiple products meet capability requirements, procure the foam with the least environmental impact.	<p>Where multiple foam products meet capability requirements, the environmental data set out in <b>Appendix 1C.B</b> must be compared by an appropriately qualified person, prior to the procurement being finalised, to ensure the foam product with the least environmental impact is procured.</p> <p>EE Branch can be contacted for support at <a href="mailto:pollution.prevention@defence.gov.au">pollution.prevention@defence.gov.au</a>.</p>	<p>Site / Base Manager</p> <p>Facility Service Delivery Personnel (Contracted / Military / Civilian)</p> <p>CASG</p> <p>Groups and Services</p>
<b>Risk Assessment</b>			
1C.1.5	Prepare an environmental risk assessment, or site sensitivity assessment, for equipment and associated activities.	<p>The risk assessment should identify potential sources of pollution, environmental receptors including exposure to sensitive ecosystems and exposure pathways between the source and environmental or human receptors. The risk assessment should take into account the whole-of-life of the equipment or facility (e.g. design, procurement, operation and disposal).</p> <p>The environmental risk assessment must be completed in accordance with the <a href="#">E&amp;IG Risk Management Framework</a> (Ref N), prior to the commencement of the storage or handling of foam products.</p> <p>In cases where equipment is ageing, particularly under-ground pipe work, the probability of the system developing or having leaks should be considered within the environmental risk assessment or site sensitivity assessment. Risks for leaks and pollution should also be considered where equipment does not meet current design standards.</p> <p>The risk assessment must be used to identify any protected places and environmentally sensitive receptors within the vicinity of the foam use and storage. Consideration must also be given to the transport of pollution in the environment. Given the expected long range transport, in air or water, of contamination, down-gradient sensitive receptors which may be impacted, should a release occur, must also be taken into consideration.</p>	<p>Site / Base Manager</p> <p>CASG</p> <p>Senior Environmental Personnel</p> <p>Environment and Sustainability Managers</p>

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Seq	Requirement	Description	Stakeholder with potential roles or responsibilities
		<p>The Australian Standard for the storage of various chemicals specifies separation distances between defined protected places (that is, facilities and receptors) see AS (Ref PP). Additional details are also included in in <a href="#">Annex 1D (Fuel and Chemical Storage and Handling)</a> of the PPMM (Ref Q).</p> <p>If an impact to the environment has been identified the location must be recorded in the Garrison Estate Management System, Environmental Factor Management – Contaminated Sites Records (GEMS EFM – CSR).</p>	
1C.1.6	Prepare a risk mitigation document that is endorsed by the Environment and Sustainability Manager (ESM).	Where a Class B foam is authorised for use in a facility by the Defence Capability Manager for firefighting foam/DEPSEC E&I, an ECC or other arrangement must be made and agreed with the relevant Environment and Sustainability Manager (ESM).	
<b>Storage</b>			
1C.1.7	Manage the storage of all foam (and complimentary firefighting agents) to prevent release to the environment.	<p>The amount of stored foam and complimentary agents such as DCP must be kept to the minimum required for operational use and emergency reserve stock.</p> <p>Storage of DCP must be in accordance with the SDS.</p> <p>Do not store foam stock near hazardous chemicals or in a hazardous environment.</p> <p>Labels should be kept intact and be clear and easy to read. Additional labels can be obtained from <a href="#">Chem Alert</a> where required.</p> <p>The SDS must be kept in a location for easy access by all personnel.</p> <p>Foam in containers with broken seals will have a reduced shelf-life. Seals should be kept intact where possible until the product is required to be used or tested.</p> <p>All storage and handling of foams and DCP should be undertaken within an area of secondary containment (e.g. a suitably sized and located bund). This includes any transfer of waste via pumping and decanting, with all pipework and joints located within the bund as well as any potential filling of transport containers.</p> <p>Leaking containers must be replaced promptly, or placed within a clean container, labelled and sealed.</p>	<p>Site / Base Manager</p> <p>Facility Service Delivery Personnel (Contracted / Military / Civilian)</p> <p>Environment and Sustainability Managers</p> <p>E&amp;IG</p> <p>Design Requirements - Capital Facilities and Infrastructure (CFI) and CFI Contractors</p> <p>Project Delivery Services (PDS) /</p>

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Seq	Requirement	Description	Stakeholder with potential roles or responsibilities
		<p>Leaking storage tanks must be repaired or replaced promptly, with adequate temporary spill control and containment measures put in place immediately upon identifying the leak.</p> <p>Any spills or waste that may be generated should be soaked up with an inert soaking material, such as saw dust, vermiculite or carbon-based products, and disposed of in accordance with disposal requirements outlined in <b>Requirements 1C.1.21 to 1C.1.27</b>. Empty containers should be disposed of by similar means or returned to the supplier.</p> <p>Spills and accidental releases must be reported through GEMS.</p>	<p>Directorate Estate Works Program Office (DEWPO)</p>
1C.1.8	<p>Design storage facilities to prevent release to the environment.</p>	<p>Appropriate storage containers (including above-ground storage tanks (ASTs) and under-ground storage tanks (USTs)) and facilities are required to minimise the risk of pollution to environment from the method of storage.</p> <p>All foam products and DCP must be stored in a cool, well-ventilated, bunded and roofed facility. Foam must be stored out of direct sunlight and rain ingress must be avoided.</p> <p>The AS 1940-2017 recommends that spill compound capacities be approximately 110% of the largest storage container or 25% of total volume stored (whichever is greatest), to facilitate the management of spill emergencies. The capacity of the bund must be assessed to account for any firefighting foam or wastewater that may be released into the bund.</p> <p>The bund must be made from an impervious material. The bund must be sealed and all piping should enter or exit the bund over the wall to the storage facility.</p> <p>Storage areas must not be connected to sewer or stormwater.</p> <p>If only small quantities are kept in storage and a fixed spill compound is unavailable, a bunded pallet with sufficient spill control may be adequate, and the need for built secondary containment may not be required. Bunded pallets must meet AS requirements for spill containment.</p> <p>Regardless of the volume of foam stock, all foam must be stored on hardstand surfaces, not on unsealed surfaces, with adequate secondary containment.</p>	<p>Site / Base Manager</p> <p>Facility Service Delivery Personnel (Contracted / Military / Civilian)</p> <p>Environment and Sustainability Managers</p> <p>E&amp;IG</p> <p>Design Requirements - CFI and CFI Contractors</p> <p>PDS / DEWPO</p>
<b>Handling</b>			
1C.1.9	<p>Undertake decanting of foams DCP with no release to the environment.</p>	<p>Decanting Class B foams from storage containers must be carried out within a bunded facility with appropriate collection systems in place, to ensure no spills are released into the environment.</p> <p>Training foams and BFFF storage containers must be decanted on hardstand as a minimum, however, it is preferred that the area is well-ventilated and bunded with appropriate collection /</p>	<p>Facility Service Delivery Personnel (Contracted / Military / Civilian)</p>

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Seq	Requirement	Description	Stakeholder with potential roles or responsibilities
		<p>drainage systems.</p> <p>DCP transfer into vehicles must be undertaken in an enclosed facility with appropriate ventilation, Purpose built transfer systems/machines must be used to avoid release of DCP. Any spills should be swept up and disposed of in sealed plastic bags in dedicated DCP waste disposal drums.</p>	
1C.1.10	Maintain plant and equipment adequately to reduce the risk of pollution.	<p>Plant and equipment includes:</p> <ul style="list-style-type: none"> <li>• fixed delivery systems (eg hangars, fuel storage areas)</li> <li>• mobile delivery systems (e.g. appliances or mobile fire extinguishers)</li> <li>• storage, collection, containment, treatment and disposal systems.</li> </ul> <p>Pollution can occur through runoff from Class B foam-contaminated infrastructure (e.g. unsealed concrete), leaks from inadequate bunding, cracks in hardstand, and loss of integrity of foam storage tanks, retaining walls, valves, pumps, flanges and seals as well as accidental discharge from the systems.</p> <p>Hard stand areas at risk of being inundated by foam should be treated to prevent absorption.</p> <p>Foam storage and handling infrastructure must be kept in good condition. Regular pollution prevention audits and maintenance must be undertaken at the facility. Auditing of foam storage and handling facilities should be undertaken in accordance with the requirements in <b>Table 1C.2</b>.</p> <p>Information on maintenance and upkeep of fixed delivery systems is included in the <a href="#">Defence Manual of Fire Protection Engineering (MFPE)</a> (Ref I).</p> <p>If defective foam storage and handling infrastructure or equipment is identified on the Defence estate, it should be logged in an <a href="#">AE547</a>, and an environmental non-conformance registered through the Garrison Estate Management System (GEMS). Personnel without access to GEMS should report all environmental incidents through the Defence <a href="#">Environmental Incident Reporting Tool</a> and notify their Chain of Command.</p> <p>The <a href="#">Base Services Support Centre (BSSC)</a> (1800 658 975) can be contacted to fix any faults.</p>	Site / Base Manager Facility Service Delivery Personnel (Contracted / Military / Civilian)
1C.1.11	Only use foams (and complimentary firefighting agents) for	<p>Different foam products (e.g. training and operational foams) are not to be mixed.</p> <p>Class B foams containing PFAS must not be used for fire training or bushfire fighting, and must be</p>	Site / Base Manager Facility Service Delivery Personnel

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Seq	Requirement	Description	Stakeholder with potential roles or responsibilities
	their intended purpose.	<p>used for their intended purpose only.</p> <p>Only approved training foams or water can be used for training activities. Equipment used in training must be completely flushed prior to introducing training foam concentrate and immediately at completion of training. Wastewater from the flushing must be collected and disposed of appropriately.</p> <p>BFFs contain surfactants to create foam and can be used to fight other Class A fires on the estate such as tyre and structural fires as appropriate.</p> <p>DCP should only be used for its intended purpose as stated in the product SDS.</p>	<p>(Contracted / Military / Civilian)</p> <p>Environment and Sustainability Managers</p>
1C.1.12	Design foam systems to mitigate releases to the environment.	<p>A purpose-built facility for hangars (for static systems) will include, as a minimum, a fully covered hardstand area (free of cracks and crevices) in a roofed hangar and be appropriately bunded. The facility must be designed to collect and contain all the foam / wastewater, as a no release (closed) system.</p> <p>Static systems are also required for fuel farms. The facility must be designed to minimise release of foam to the environment. Controls may include bunding and collection systems.</p> <p>An annex facility will be designed to pump water or foam product for periodic testing of the functionality of the whole system, as well as proportionality testing. The annex facility must be designed to collect and contain the foam / wastewater, as a no release (closed) system.</p> <p>Fuel farm and other Defence Fuel Installation (DFI) testing facilities must be designed to collect and contain the foam / wastewater in a closed system.</p> <p>Foam wastewater must be captured and tested for PFAS in order to determine the most appropriate re-use or disposal method. EE Branch can be contacted for support regarding testing requirements at <a href="mailto:pollution.prevention@defence.gov.au">pollution.prevention@defence.gov.au</a>.</p> <p>The facility must be maintained to minimise accidental activations of the system. In addition, the system should include installation of a detection and external / remote control system to expedite rapid deactivation where appropriate.</p>	<p>Site / Base Manager</p> <p>Facility Service Delivery Personnel (Contracted / Military / Civilian)</p> <p>Design Requirements - CFI and CFI Contractors</p>
1C.1.13	Complete testing of and flushing of fixed foam systems with no release to the environment.	<p>Defence requires that static fire suppression systems are appropriately tested for operational effectiveness. Environmental controls for the testing are as follows:</p> <ul style="list-style-type: none"> <li>The facility (fixed system) should be designed to collect and contain the foam / wastewater, as a no release (closed) system. During testing there should be no egress from the facility.</li> </ul>	<p>Site / Base Manager</p> <p>Facility Service Delivery Personnel (Contracted / Military</p>



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Seq	Requirement	Description	Stakeholder with potential roles or responsibilities
		<ul style="list-style-type: none"> <li>• The testing of fixed systems in the hangars or fuel farms must use water as a testing medium where possible.</li> <li>• Hard stand areas at risk of being inundated with foam should be treated to prevent absorption.</li> <li>• The majority of the testing program should be planned and conducted using plain water, as far as practicable. This water may be recycled or re-used for other purposes, if it can be shown it is not contaminated with residual PFAS contamination, but it is not to be mixed with foam wastewater. The foam product must only be used when it is essential, and the volume of the generated foam should be kept to a minimum.</li> <li>• The testing and flushing must not be conducted during periods of rainfall, if the test facility is uncovered.</li> <li>• The fixed systems should be appropriately designed to collect and contain the wastewater in a dedicated tank for storage until ready for treatment or disposal. If a Class B foam is in use in the system the wastewater is to be collected and it is preferred that the wastewater is disposed of by the National Waste Contractor (NWC).</li> <li>• Where an onsite treatment facility exists water may be treated prior to disposal by the NWC.</li> <li>• Any solid waste resulting from oil / water separator must be disposed of by the NWC.</li> <li>• Foam wastewater generated by testing and flushing could be of a significant volume. To minimise the wastewater treatment costs for off-site disposal (charges paid on the basis of volume), the volume of wastewater generated by testing and flushing must be tightly controlled and kept to a minimum. The volume of wastewater generated through testing and flushing is not to be diluted by mixing the foam wastewater with the plain water collected from the initial testing. Minimising the volume of wastewater is consistent with the <a href="#">Defence Waste Minimisation Policy</a> (Ref G).</li> <li>• All personnel conducting the foam testing and flushing shall be aware of their environmental obligations and make every effort to ensure that foams and related substances are contained. This process should be formalised through the completion of an Environmental Clearance Certificate (ECC), or through Standard Operating Procedures (SOPs). Environment and Sustainability Managers should be consulted where necessary for further advice.</li> </ul> <p>Where a purpose-built facility is not available, or where the facility is unusable for maintenance reasons or unable to contain the wastewater (either design problems or large cracks rendering</p>	<p>/ Civilian) Fire Fighters</p>

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Seq	Requirement	Description	Stakeholder with potential roles or responsibilities
		<p>containment of wastewater difficult), the testing and flushing activity should not occur. If operational requirements arise, under a full ECC, and only where no other options exist, testing may be conducted on hardstand areas. The hardstand area must be appropriately bunded. The state and location of the hardstand must be assessed prior to testing of the facility (e.g. lining state of repairs, condition of expansion gaps, and accessibility of contaminants to sensitive flora, fauna or water catchments). All wastewater generated must be able to be contained and disposed of in accordance with this Guideline. Testing must not occur on days of rain or high wind.</p>	
1C.1.14	<p>Complete testing of and flushing of vehicles and portable firefighting equipment with no release to the environment.</p>	<p>Testing and flushing activities of vehicles and portable firefighting equipment must be conducted in an appropriately designed facility (closed system capable of capturing, diverting, treating (where possible) and storing of generated wastewater and run-off).</p> <p>The volume of spent foam concentrate / wastewater is to be minimised during testing and flushing of firefighting equipment or systems.</p> <p>Plant, equipment and infrastructure associated with the purpose-built facility where testing of firefighting equipment, vehicles, extinguishers, and decanting of Class B foam products occurs, will have different design features as distinct from the static systems design. This facility will:</p> <ul style="list-style-type: none"> <li>• Be designed with a hardstand area, surrounded by foam retaining walls without any gaps to contain at least 180 degree arc of spraying of the foam by hand- held nozzles.</li> <li>• Have a hardstand area installed on a continuous liner or system demonstrated to be impervious to PFAS, to prevent the spread of foam products into the soil, groundwater and / or the facility</li> <li>• Have stormwater diversions around the facility where required.</li> <li>• Have bunding to fully contain foam / wastewater, but should be able to divert rain water from the foam wastewater. The hardstand area and the walls must be large enough and be capable of conducting testing of the vehicle monitors and other mobile firefighting equipment or extinguishers, and must be free of cracks or crevices.</li> <li>• Not be used for the testing and flushing of equipment, inspection or refilling of extinguishers, and the decanting of foam from one container to another during periods of rainfall or high winds, where the purpose-built facility is not covered.</li> <li>• Allow for rainwater run-off from the hardstand area to be diverted for recycling purposes, during non-activity periods, however, it must not be mixed with the foam wastewater.</li> <li>• Be designed in a manner to collect and contain the foam / water, as a no release (closed)</li> </ul>	<p>Site / Base Manager</p> <p>Facility Service Delivery Personnel (Contracted / Military / Civilian)</p> <p>Fire Fighters</p>

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Seq	Requirement	Description	Stakeholder with potential roles or responsibilities
		<p>system.</p> <ul style="list-style-type: none"> <li>• After testing, be required to be flushed with fresh water to the holding tank to remove residual foam from the concrete surface which would otherwise remain when the surface dries.</li> <li>• Be designed for fuel fire training use and the foam / water separator will be designed to capture any escaping unburnt fuel in the foam / water.</li> <li>• Be designed to accommodate decanting. Where specifically designed decanting areas are not available, decanting of Class B foam will be carried out within the facility.</li> </ul> <p>Similarly, portable equipment, such as extinguishers must be inspected or emptied / recharged on-site in the same purpose-built area. Alternatively, the extinguishers can be emptied / recharged off-site by a suitable contractor. Foam wastewater generated by testing and flushing could be of a significant volume. To minimise the wastewater treatment costs for off-site disposal (charges paid on the basis of volume), the volume of wastewater generated by testing and flushing must be tightly controlled and kept to a minimum. The volume of wastewater generated through testing and flushing is not to be diluted by mixing the foam wastewater with the plain water collected from the initial testing. Minimising the volume of wastewater is consistent with the Defence Waste Minimisation Policy (Ref F).</p> <p>Regular maintenance and inspections must be conducted in accordance with <b>Table 1.C.2</b>. Equipment must be maintained in an appropriate condition, and repaired or replaced when needed.</p> <p>All personnel conducting the foam testing and flushing shall be aware of their environmental obligations and make every effort to ensure that foams and related substances are contained. This process should be formalised through the completion of an Environmental Clearance Certificate (ECC), or through Standard Operating Procedures (SOPs). Environment and Sustainability Managers should be consulted where necessary for further advice.</p>	
1C.1.15	Conduct firefighting training in purpose-built facilities with a collection system for generated foam and water.	All personnel conducting firefighting training shall be aware of their environmental obligations and make every effort to ensure that foams and related substances are contained and there is no release to the environment. The environmental controls for the training activity must be formalised through the completion of an Environmental Clearance Certificate (ECC), or other arrangement made and agreed with the relevant Environment and Sustainability Manager (ESM), or through Standard Operating Procedures (SOPs). Environment and Sustainability Managers must be consulted for further advice and/or for awareness. Environmental controls for firefighting training are	Site / Base Manager Facility Service Delivery Personnel (Contracted / Military / Civilian) Fire Fighters

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Seq	Requirement	Description	Stakeholder with potential roles or responsibilities
	Test DCP in suitably controlled environments.	<p>as follows:</p> <ul style="list-style-type: none"> <li>• Training foams and water must be used except where the training with Class B foams is required to meet personnel qualification requirements. Training with Class B foams can only be undertaken at a facility designed specifically for this purpose. All other training must only occur using training foam or water.</li> <li>• Firefighting training on a mock-up building / structure is to be conducted in a purpose-built facility. Similarly, all Class B fire training must be conducted using appropriate facilities only. The purpose-built facility or appropriate facility should incorporate an oil / water separation system, foam retaining wall and containment system, which directs the flow into a holding tank or evaporation pond for either re-use or recycling of the wastewater or for ultimate disposal.</li> <li>• Where a purpose-built facility is not available, or where the facility is unusable for maintenance reasons or unable to contain the wastewater (either design problems or cracks rendering containment of wastewater difficult), the training activity should not occur.</li> <li>• Training must not be conducted during periods of rainfall or strong winds.</li> <li>• Spraying shall be confined to the target area, and at no time shall the foam solution be sprayed over a large area.</li> <li>• Spraying of foam solution is to occur on hardstand areas approved for that use only and spraying on vegetation, soil, or water courses or any area outside of the target area is not permitted at any time.</li> <li>• Firefighting equipment and facilities must be maintained in good order.</li> <li>• The volume of wastewater generated from the flushing of firefighting equipment, and the washing of the hardstand and wall area of the training facility at the end of the training must be kept to a minimum, and all generated wastewater must be contained. After training and maintenance activities, the hardstand area is to be flushed with fresh water into the sump system to remove foam contaminants that would otherwise remain on the hardstand when the area dries.</li> <li>• Water generated from the fire training activities must not enter the environment, and must be directed away from stormwater systems.</li> <li>• Some fire training areas may need additional controls as the infrastructure may be</li> </ul>	<p>Maintenance Agencies (e.g. Royal Australian Air Force (RAAF) Mechanical Equipment Operations and Maintenance Section (MEOMS))</p> <p>Environment and Sustainability Managers</p>

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Seq	Requirement	Description	Stakeholder with potential roles or responsibilities
		<p>contaminated with PFAS or other site specific contaminants from historical training activities. Wastewater from sites with PFAS contamination will need to be disposed of in accordance with the PFAS NEMP or by a suitably qualified waste contractor.</p> <ul style="list-style-type: none"> <li>All solid particulate and unburnt fuel (where applicable) should be separated from the foam / wastewater mix and disposed of appropriately. If fuels have been used for training then the materials may need to be disposed of as hazardous waste ((refer to <b>Annex 1H</b> (Solid Waste Storage and Handling) and <a href="#">Annex 1E</a> (Liquid Waste Storage and Handling) of the PPMM).</li> </ul> <p>Training procedures and processes must be reviewed periodically in line with the changing environmental requirements in consultation with the Environment and Sustainability Managers.</p> <p>The following control measures should be adopted in standard operating procedures for testing of DCP:</p> <ul style="list-style-type: none"> <li>The minimum of DCP should be used to achieve testing objectives.</li> <li>DCP should be tested in suitably enclosed facilities to prevent release to the environment. As a minimum this should include a roof, hardstand floor and three walls.</li> <li>Dry clean up procedures should be used to collect DCP residues following testing to prevent release to the environment.</li> <li>Dispose of dry residues in sealed plastic bags (to prevent dust generation) in dedicated DCP waste disposal drums.</li> <li>WHS requirements set out in the product SDS should be incorporated into the standard operating procedures for testing of DCP.</li> </ul>	
<b>Drainage Systems and Containment</b>			
1C.1.16	Conduct wastewater collection and storage within a closed system.	<p>Foam wastewater must not be directed to stormwater drains, vegetation, soil, wetlands, groundwater, or directly to sewer systems (including sewer associated with Defence operated Wastewater Treatment Plants (WWTP)).</p> <p>The facility must be a closed system. The designer must ensure that the wastewater will not be released into the stormwater drain or the environment under any circumstances (see <b>Section 1C.1.13</b>).</p> <p>During an emergency firefighting operation, where total containment of wastewater may not be achieved, the incident must be reported to the relevant Environment and Sustainability Manager</p>	<p>Site / Base Manager</p> <p>Facility Service Delivery Personnel (Contracted / Military / Civilian)</p> <p>CFI</p> <p>Environment and</p>

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		and reported through GEMS. Personnel without access to GEMS should report all environmental incidents through the Defence <a href="#">Environmental Incident Reporting Tool</a> .	Sustainability Managers
1C.1.17	Design wastewater / foam collection systems as closed systems.	<p>Wastewater / foam collection systems will be similar for all foam facilities, and integrated collections and storage systems may be feasible for the base / site.</p> <p>The following environmental requirements will apply for the wastewater / foam collection systems:</p> <ul style="list-style-type: none"> <li>• The system including the oil separator must be designed with appropriate capacity to avoid overflow from the flow channels and the residence time through the system will be rated sufficiently to allow full coalescence of the foam.</li> <li>• The separator must have the ability to remove solid sludge from the wastewater / foam for off-site disposal.</li> <li>• Wastewater may be allowed to gravitate to a dedicated tank, for storage. Where the wastewater is directed to a sump, consideration should be given to its integrity for the purpose and its capacity to hold wastewater without overflow.</li> <li>• The pump for the wastewater from the sump must be sized and rated correctly, and designed adequately to transfer the wastewater to a dedicated tank or an evaporation pond.</li> <li>• The dedicated tank storage facility (AST preferred) must be able to hold at least the volume of wastewater generated from six weeks of operation, plus the volume of wastewater that may be generated from any overflows. The tank will be covered to avoid rain ingress.</li> <li>• The tank will be suitable for the storage of foam contaminated wastewater (e.g. it should be coated internally to prevent corrosion from foam) and be accessible for periodic cleaning and sludge collection. The tank will be fitted with a dedicated pump (appropriately sized and rated) to transfer wastewater for disposal.</li> </ul> <p>Evaporation ponds are not the preferred method of containment of foam contaminated water, and no new evaporation ponds should be constructed. If an evaporation pond currently exists on site, and is part of an existing system, the following must apply until the system can be upgraded:</p> <ul style="list-style-type: none"> <li>• The evaporation pond must be designated for the purpose and have sufficient capacity to capture any overflow as well as any rain ingress (in the case of an open pond). No clean stormwater will be directed to the evaporation pond</li> <li>• The evaporation pond must be made inaccessible to all non-essential personnel, and minimise</li> </ul>	<p>Site / Base Manager</p> <p>Facility Service Delivery Personnel (Contracted / Military / Civilian)</p> <p>CFI</p> <p>Environment and Sustainability Managers</p>

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Seq	Requirement	Description	Stakeholder with potential roles or responsibilities
		<p>access to terrestrial fauna and birds</p> <ul style="list-style-type: none"> <li>• The evaporation pond must have an impervious layer such as a High Density Polyethylene (HDPE) layer, supported by an impervious clay layer, to avoid direct seepage of foam products into the soil, or groundwater</li> <li>• The pond must have a sludge collection system for periodical removal of sludge. The sludge, or any other particulate solid collected from the pond, must be tested for PFAS and other site specific contaminants and disposed of to a suitable facility.</li> </ul>	
<b>Treatment and / or disposal</b>			
1C.1.18	Foam and wastewater containing PFAS (including stormwater) must be managed appropriately.	<p>All waste from foam spills, accidental release, training activities, and where possible emergency incidents, should be diverted to a holding tank prior to disposal.</p> <p>No diversion of run-off or wastewater to stormwater is allowed from facilities associated with the use of fluorinated foam products.</p> <p>The drain valves of collection systems must remain closed at all times, except under supervision during emptying for disposal by the NWC.</p> <p>The re-use of foam contaminated water, including treated wastewater, can be considered where it meets relevant guideline values. The PFAS NEMP sets out guidance on acceptable re-use of PFAS contaminated water onsite.</p> <p>The <a href="#">Directorate of PFAS Remediation</a> in EE Branch can provide indicative treatment criteria on a site by site basis, at sites where PFAS water treatment plants have been established. The use of Directorate of PFAS Remediation PFAS Water Treatment Plants (these are specific PFAS treatment plants and differ from waste water treatment plants) may be available to Defence projects. Contact <a href="#">Directorate of PFAS Remediation</a> for more information.</p> <p>Any consideration of re-use of foam contaminated water must be discussed with the local environment and sustainability manager.</p> <p>Consideration must be given to other potential contaminants (e.g. nutrients, petroleum hydrocarbons). All analytes must meet the Australian and New Zealand Guidelines for Fresh or Marine Water Quality criteria (dependant on location) prior to discharge to the environment or for onsite re-use, this includes treated wastewater or foam.</p> <p>Analytical testing of wastewater containing PFAS for off-site disposal and on-site re-use must be</p>	<p>Site / Base Manager</p> <p>Facility Service Delivery Personnel (Contracted / Military / Civilian)</p> <p>Environment and Sustainability Managers</p> <p>NWC</p>

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Seq	Requirement	Description	Stakeholder with potential roles or responsibilities
		<p>conducted in accordance with all relevant Defence, Commonwealth and relevant State / Territory requirements.</p> <p>Acceptable re-use options which may be available to Defence are:</p> <ul style="list-style-type: none"> <li>• Irrigation of non-edible crops</li> <li>• Dust suppression</li> <li>• Industrial process water.</li> </ul> <p>Re-use of water on site must be completed with an ECC in place, unless other arrangements have been made and are agreed with the relevant Environment and Sustainability Manager (ESM).</p> <p>Most current wastewater treatment plants (WWTP) are not able to treat PFAS in wastewater. This includes most Defence operated WWTPs.</p> <p>Any water discharged from the facility via sewer must meet the requirements set out in the TWA.</p> <p>Foams which are fully biodegradable and contain no PFAS, including PFAS from cross-contamination, can be disposed to sewer under a TWA, or with an agreement with the operator of a Defence-owned WWTP. Consideration must be given to the ability of the WWTP to be able to treat the foam.</p> <p>Further information on wastewater treatment can be found in in <a href="#">Annex 1J</a> (Wastewater Treatment Plants) of the PPMM.</p> <p>Packaging and labelling of waste for transport must be compliant with the PFAS NEMP (Ref AA) and applicable State or Territory requirements, where relevant.</p>	
1C.1.19	Implement appropriate controls for the treatment and reuse of foam wastewater.	<p>The treatment of foam / wastewater should be risk assessed using the process described in <b>Requirement 1C.1.5</b> above. The specific treatment process to treat foam wastewater should be developed in consultation with the EE Branch, and an appropriately qualified and experienced professional.</p> <p>Any by-products or secondary wastes (including solid wastes) generated in the treatment process must be disposed of in accordance with <b>Requirement 1.C.23</b> below.</p> <p>Where non-fluorinated foam wastewater after initial holding and bio-degradation (following its containment for a period of time), contains no PFAS or other contaminants and meets water quality requirements for release to the environment, this wastewater may be able to be released on site.</p>	<p>Site / Base Manager</p> <p>Facility Service Delivery Personnel (Contracted / Military / Civilian)</p> <p>NWC</p> <p>Environment and Sustainability Managers</p>



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Seq	Requirement	Description	Stakeholder with potential roles or responsibilities
		Some foams (e.g. BFFF) may be treated by direct application to suitable ground for bio-degradation. This must be completed under an ECC (or other arrangement made and agreed with the relevant Environment and Sustainability Manager (ESM)) and liaison with the regional environmental staff is required before any disposal to the environment.	EE Branch
1C.1.20	Treat foam wastewater to a level that complies with site specific discharge criteria.	<p>If foam wastewater is being discharged from the Defence estate, it must be treated and shown to meet site specific discharge criteria which comply with the applicable Commonwealth, State / Territory and local regulations (such as a TWA). If local regulations are not available, appropriate criteria must be developed in consultation with the following stakeholders:</p> <ul style="list-style-type: none"> <li>• Local authorities responsible for receiving the wastewater (e.g. local water authority, State or Territory environmental authorities)</li> <li>• Appropriately qualified and experienced environmental professionals</li> <li>• Defence personnel (including site / base personnel and the EE Branch).</li> </ul> <p>Where site specific discharge criteria are unable to be established, foam wastewater must not be discharged from the site / base. Instead it should be disposed of to an appropriately licensed facility.</p>	<p>Site / Base Manager</p> <p>Facility Service Delivery Personnel (Contracted / Military / Civilian)</p> <p>Environment and Sustainability Managers</p>
1C.1.21	Appropriately monitor treated wastewater to ensure it meets site specific discharge criteria or relevant disposal requirements.	Refer to <b>Table 1C.2</b> below.	<p>Site / Base Manager</p> <p>Facility Service Delivery Personnel (Contracted / Military / Civilian)</p> <p>Environment and Sustainability Managers</p>
1C.1.22	Re-use or recycle treated foam wastewater where possible.	<p>Treated wastewater may be re-used or recycled only where PFAS has been removed to the standards described below, and with an ECC in place or other arrangement made and agreed with the relevant Environment and Sustainability Manager (ESM). Water quality must be validated by an appropriately qualified and experienced environmental professional prior to re-use or recycling.</p> <p>ESD and WOL principles should be considered where possible. Further information on ESD and WOL can be found in the Defence <a href="#">Smart Infrastructure Handbook</a> (Ref M).</p> <p>In order of preference, the following re-use / recycling options for wastewater impacted by PFAS are</p>	<p>Site / Base Manager</p> <p>Facility Service Delivery Personnel (Contracted / Military / Civilian)</p> <p>Environment and Sustainability</p>

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Seq	Requirement	Description	Stakeholder with potential roles or responsibilities
		<p>available for consideration where all requirements are met:</p> <ol style="list-style-type: none"> <li>1. <u>Onsite irrigation / infiltration</u>                      Any volume of wastewater may be discharged to environment by onsite irrigation / infiltration where the following are met:                     <ol style="list-style-type: none"> <li>a. The water has been treated to below LOR where LOR is 0.01 µg/L total PFAS by TOP assay</li> <li>b. No other unacceptable risk exists, including from non-PFAS contaminants</li> <li>c. an ECC is in place, or other arrangements have been made and are agreed with the relevant Environment and Sustainability Manager (ESM).</li> </ol> <p>If treatment to the criteria is not possible, onsite irrigation / infiltration for beneficial reuse by irrigation / infiltration may still be acceptable where a suitably qualified environmental professional has assessed the environmental risks and concluded they are acceptable with reference to:</p> <ol style="list-style-type: none"> <li>a. The use of regional groundwater for drinking water supply</li> <li>b. The highest beneficial use of water in the downstream environment</li> <li>c. The surrounding surface water environment</li> <li>d. The total load of PFAS in the wastewater (include all discharges from site)</li> <li>e. No other unacceptable risk exists, including from non-PFAS contaminants</li> </ol> </li> <li>2. <u>Discharge to engineered stormwater drains and infrastructure (onsite or offsite)</u> <ol style="list-style-type: none"> <li>a. PFOS and PFOA concentrations are less than PFAS NEMP freshwater or marine guideline values (as deemed relevant by a suitably qualified environmental professional).</li> </ol> </li> </ol>	<p>Managers Contractors</p>

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Seq	Requirement	Description	Stakeholder with potential roles or responsibilities
		<ul style="list-style-type: none"> <li>b. Concentrations of other contaminants are less than relevant values in the Australian and New Zealand Guidelines for Fresh or Marine Water Quality (as deemed relevant by a suitably qualified environmental professional).</li> <li>c. In accordance with relevant state / territory / local regulations, including holding any required licences and permits.</li> <li>d. An ECC is in place or other arrangements have been made and are agreed with the relevant Environment and Sustainability Manager (ESM).</li> <li>e. Discharge is monitored for contaminants of concern during routine water quality monitoring.</li> </ul> <p>3. <u>Discharge to sewer</u></p> <ul style="list-style-type: none"> <li>a. A Trade Waste Agreement (TWA) and ECC (or other arrangement made and agreed with the relevant Environment and Sustainability Manager (ESM)) are in place.</li> <li>b. Concentrations of PFAS and other contaminants meet criteria set out in the TWA.</li> </ul> <p>Re-use of wastewater from WWTP must be undertaken in accordance with Guidelines for Sewerage Systems, Use of Reclaimed Water (Ref A) and <a href="#">Annex 1J</a> (Wastewater Treatment Plants) of the PPMM.</p>	
1C.1.23	Conduct foam waste transportation in accordance with relevant State or Territory requirements, using appropriately licensed waste contractors.	<p>All transportation of waste must be handled by appropriately licensed waste transporting contractors, according to the applicable State or Territory requirements, where relevant. At a site / base level, the NWC can provide this service.</p> <p>Where the treatment option is unavailable, an accredited trade waste disposal contractor shall be engaged to dispose of the wastewater off-site as a liquid waste to an authorised State or Territory liquid effluent treatment centre or wastewater treatment centre. The contractor will submit the details of the quantity of the waste, where the waste has been deposited, and a formal acceptance receipt of the waste from the receiver to the facility manager and the contract manager.</p> <p>PFAS-contaminated materials, including waste PFAS-containing products are considered to be Dangerous Goods Class 9 by the States and Territories. Waste must be managed in accordance with the PFAS NEMP (Ref AA) which includes the following labelling requirements:</p> <ul style="list-style-type: none"> <li>• Category: Organic chemical (M)</li> </ul>	<p>Site / Base Manager</p> <p>Facility Service Delivery Personnel (Contracted / Military / Civilian)</p> <p>NWC</p> <p>Environment and Sustainability Managers</p>

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Seq	Requirement	Description	Stakeholder with potential roles or responsibilities
		<ul style="list-style-type: none"> <li>• Description: Per- and poly-fluoroalkyl substances (PFAS) contaminated materials, including waste PFAS containing products and contaminated containers</li> <li>• Waste Code: M270</li> </ul> <p>The associated waste descriptions must include a reference to the PFAS present, sufficient to accurately reflect the nature of the waste. Where multiple waste codes apply, the waste must be reported using the description 'Per- and polyfluoroalkyl substances (PFAS) contaminated materials, including PFAS-containing waste products and contaminated containers'.</p> <p>Further information on transport of solid and liquid wastes can be found in the PPMM <a href="#">Annex 1E</a>: Liquid Waste Storage and Handling and <a href="#">Annex 1H</a>: Solid Waste Storage and Handling.</p> <p>Evidence of appropriate disposal should be kept by Defence personnel in an electronic format and by the NWC.</p>	
1C.1.24	Appropriately manage infrastructure and equipment contaminated with fluorinated foam residues to avoid human health and environmental impacts.	<p>Potentially PFAS contaminated infrastructure and equipment can include:</p> <ul style="list-style-type: none"> <li>• Foam delivery systems (including fixed and mobile systems)</li> <li>• Floors, walls and other surfaces</li> <li>• Holding tanks</li> <li>• Drains</li> <li>• Firefighting training equipment, facilities and structures</li> <li>• Equipment required to clean up firefighting foams (including clothing).</li> </ul> <p>Where disposal of old infrastructure, equipment and / or debris are required, it must be segregated and decontaminated prior to disposal to meet the relevant state and territory regulations. Where there is a need for new infrastructure, the associated CEMP must include scope for decontamination and disposal of contaminated material for review by Defence.</p> <p>Decontamination may include flushing and cleaning with water to reduce the PFAS/other contaminant load of the equipment or infrastructure.</p> <p>All wastewater from cleaning activities is required to be collected, contained and managed in accordance with Requirement 1C.1.21 Wastewater must be tested for PFAS and other contaminants prior to disposal / discharge. Wastewater containers must be managed as per Requirement 1C.1.25.</p>	<p>Site / Base Manager</p> <p>Facility Service Delivery Personnel (Contracted / Military / Civilian)</p> <p>Environment and Sustainability Managers</p> <p>NWC</p>

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Seq	Requirement	Description	Stakeholder with potential roles or responsibilities
		<p>On completion of the decontamination, the equipment or infrastructure must be tested and be below laboratory limit of reporting for PFAS compounds. If PFAS are still present further decontamination may be required. Sampling for testing is conducted by capturing water run-off directly from the cleaned equipment.</p> <p>If the infrastructure / equipment are unable to be decontaminated on the site / base, it must be categorised, transported and disposed of to an appropriately licensed facility, in accordance with applicable State or Territory regulations, where relevant (see <b>Requirement 1C.1.24</b>).</p>	
1C.1.25	Dispose of waste from cleaning and treatment activities appropriately	<p>Waste by-products, including solid and liquid waste from treatment and cleaning of contaminated assets must be disposed of appropriately, in accordance with Annex 1E Liquid Waste Storage and Handling and Annex 1H Solid Waste Storage and Handling and relevant state or territory regulations.</p> <p>PFAS contaminated waste must be labelled in accordance with the PFAS NEMP (Ref AA) prior to disposal and transport.</p> <p>The treatment of infrastructure must include appropriate controls to prevent, contain and clean-up spills or leaks of wastewater (treated and un-treated), by-products and any chemicals used in the treatment process (see <b>Table 1C.2</b> and <b>Table 1C.3</b> and below).</p>	<p>Site / Base Manager</p> <p>Facility Service Delivery Personnel (Contracted / Military / Civilian)</p> <p>Contractors</p>
1C.1.26	Manage all Class B, including fluorinated, foam containers as contaminated material and dispose of appropriately.	All containers which have contained foam must be managed as contaminated material. Where they cannot be reused or recycled they must be disposed of in accordance with the state or territory regulations.	<p>Site / Base Manager</p> <p>Facility Service Delivery Personnel (Contracted / Military / Civilian)</p>
<b>Disposal of concentrate</b>			
1C.1.27	Store and handle foam concentrate appropriately during disposal to avoid human health and environmental impacts.	<p>See <b>Requirements 1C.1.6 – 1C.1.21</b> above for information on storage and handling considerations.</p> <p>Waste storage facilities should be included in monitoring and auditing activity requirements outlined in <b>Table 1C.2</b>.</p>	<p>Site / Base Manager</p> <p>Facility Service Delivery Personnel (Contracted / Military / Civilian)</p> <p>Environment and</p>

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Seq	Requirement	Description	Stakeholder with potential roles or responsibilities
			Sustainability Managers
1C.1.28	Conduct the transport of waste foam concentrate in accordance with relevant State or Territory requirements, using appropriately licensed waste contractors.	<p>Transportation of waste foam concentrate for disposal must be in accordance with <b>Requirement 1C.1.23</b> and the relevant State or Territory requirements, by an appropriately licenced contractor.</p> <p>Further information on transport of solid and liquid wastes can be found in the PPMM <a href="#">Annex 1E</a>: Liquid Waste Storage and Handling and <a href="#">Annex 1H</a>: Solid Waste Storage and Handling.</p>	<p>Site / Base Manager</p> <p>Facility Service Delivery Personnel (Contracted / Military / Civilian)</p> <p>Environment and Sustainability Managers</p>
1C.1.29	Dispose of waste contaminated with PFOS in accordance with the Stockholm Convention for disposal of POPs (POPs).	<p>Disposal of contaminated solid wastes which contain PFOS above 50mg/kg must meet the requirements of article 6 of the Stockholm Convention on POPs.</p> <p>Where such action is not practical, proponents can propose an alternative disposal method for consideration by <a href="#">Directorate of Contamination and Remediation Management (DCARM)</a>.</p> <p>The PFAS NEMP (Ref AA) and State / Territory requirements and guidance must be considered for disposal of any waste contaminated with PFAS, where relevant.</p> <p>PFOA and PFHxS are currently being considered for listing under the Stockholm Convention, therefore any foam containing PFOA or PFHxS must be treated in the same manner when considering disposal. Other PFAS may also need to be considered prior to disposal.</p>	<p>Site / Base Manager</p> <p>Facility Service Delivery Personnel (Contracted / Military / Civilian)</p> <p>NWC</p> <p>Environment and Sustainability Managers</p>
1C.1.30	Dispose of foam wastes to appropriately licensed facilities, in accordance with State or Territory regulations.	Foam waste must be categorised in accordance with applicable State or Territory regulations prior to disposal.	<p>Facility Service Delivery Personnel (Contracted / Military / Civilian)</p> <p>NWC</p>
1C.1.31	Where current available treatment or disposal options are not considered viable by regional environmental staff,	<p>The persistent, bioaccumulative and toxic (PBT) nature of some foam product constituents means that their prompt disposal significantly lowers Defence’s environmental risk. Therefore these substances should be appropriately disposed of as soon as a viable option is available. Any storage of foam waste should be included in the risk assessment described in <b>Requirement 1C.1.5</b>.</p> <p>Management controls in <b>Requirements 1C.1.6 – 1C.1.21</b> above should be applied to the storage</p>	<p>Site / Base Manager</p> <p>Facility Service Delivery Personnel (Contracted / Military / Civilian)</p>

Pollution Prevention Guideline Annex 1C – Firefighting Foam Management

Seq	Requirement	Description	Stakeholder with potential roles or responsibilities
	store foam stock and wastewater appropriately until a viable option becomes available.	and handling of foam wastes. Temporary storage facilities should be included in monitoring and auditing activities outlined in <b>Table 1C.2.</b>	Environment and Sustainability Managers
1C.1.32	Manage and dispose of infrastructure and equipment contaminated with fluorinated foam residues appropriately to avoid human health and environmental impacts.	<p>Infrastructure and equipment with potential to be contaminated with PFAS include:</p> <ul style="list-style-type: none"> <li>• Foam delivery systems (including fixed and mobile systems)</li> <li>• Floors, walls and other surfaces</li> <li>• Holding tanks</li> <li>• Drains</li> <li>• Firefighting training equipment, facilities and structures</li> <li>• Equipment required to clean up firefighting foams (including clothing).</li> </ul> <p>Where disposal of old infrastructure, equipment and / or debris are required, it must be segregated and decontaminated prior to disposal to meet the relevant state and territory regulations. Where there is a need for new infrastructure, the associated CEMP must include scope for decontamination and disposal of contaminated material for review by Defence.</p> <p>If the infrastructure / equipment are unable to be decontaminated on the site / base, it must be categorised, transported and disposed of to an appropriately licensed facility, in accordance with applicable State or Territory regulations, where relevant (see Requirement 1C.1.24).</p>	<p>Site / Base Manager</p> <p>Facility Service Delivery Personnel (Contracted / Military / Civilian)</p> <p>Environment and Sustainability Managers</p> <p>NWC</p>
1C.1.33	Immediately notify identified stocks of 3M Light Water stock to the PFAS Investigation and Management Branch and Defence Special Council	<p>If any 3M Light Water stock is identified on the Defence estate, the Directorate of PFAS Remediation (DPFASR) and the Office of Defence Special Counsel (ODSC) must be advised immediately via the following inboxes: <a href="mailto:PFAS.EstateManagement@defence.gov.au">PFAS.EstateManagement@defence.gov.au</a> and <a href="mailto:dl.specialcounsel@defence.gov.au">dl.specialcounsel@defence.gov.au</a>.</p> <p>ODSC approval must be obtained prior to disposal. Once approval has been obtained, the 3M Light Water stock must be disposed of to an appropriately licensed facility, in accordance with State or Territory regulations, utilising extant base contractors.</p> <p>DPFASR can provide further specific management advice, if required.</p> <p>An environmental incident must be recorded as soon as practicable when 3M Light Water has been</p>	<p>Site / Base Manager</p> <p>Facility Service Delivery Personnel (Contracted / Military / Civilian)</p> <p>NWC</p> <p>ODSC</p> <p>PFASIM Branch</p>

Pollution Prevention Guideline Annex 1C – Firefighting Foam Management

<b>Seq</b>	<b>Requirement</b>	<b>Description</b>	<b>Stakeholder with potential roles or responsibilities</b>
		identified via the Chain of Command and GEMS. Personnel without access to GEMS should report all environmental incidents through the Defence <a href="#">Environmental Incident Reporting Tool</a> .	Environment and Sustainability Managers



### **MONITORING, AUDITING AND REPORTING**

28. As with any pollution prevention initiative, its performance needs to be monitored to ensure the environment continues to be protected. Results and observations are required to be adequately maintained and, where a non-conformance exists it should be reported using GEMS, and the appropriate actions need to be undertaken in a timely manner. Personnel without access to GEMS should report all environmental incidents through the Defence [Environmental Incident Reporting Tool](#).

29. **Table 1C.2** outlines monitoring, auditing and reporting requirements to be implemented across Defence activities.

**Table 1C.2: Requirements for Monitoring, Auditing and Reporting**

Seq	Requirement	Description	Stakeholder with potential roles or responsibilities
<b>Monitoring and Auditing</b>			
1C.2.1	Undertake regular inspections against requirements in the facility management plan.	<p>A management plan for facilities using or managing foams must include pollution prevention requirements.</p> <p>The requirements for the maintenance and upkeep of the foam facility should be included in routine and long term inspection of the facility.</p> <p>As a minimum, maintenance / inspections must be undertaken for:</p> <ul style="list-style-type: none"> <li>• General housekeeping</li> <li>• All storage areas</li> <li>• Secondary containment systems</li> <li>• Spill kits</li> <li>• Leak monitoring systems</li> <li>• Gauges and dispensing equipment</li> <li>• Drainage systems and foam / water separators</li> <li>• Monitoring equipment</li> <li>• Waste holding tanks or evaporation ponds etc.</li> </ul> <p>Records of inspections should be kept at the facility.</p>	Facility Service Delivery Personnel (Contracted / Military / Civilian)
1C.2.2	Repair or cease use of facilities that are shown to be faulty, leaking or that do not meet the minimum standard as outlined in <b>Table 1C.1</b> of this Guideline.	<p>During site inspections, any non-conformance can be noted and a <a href="#">GEMS Incident Form</a> completed. Should a leak or non-conformance be identified, controls must be put in place to minimise the leak or spill or use of the facility should cease until repairs are undertaken.</p> <p>A review of the impact to health and safety and emergency response capability must be considered prior to shutting down any system or equipment.</p>	Facility Service Delivery Personnel (Contracted / Military / Civilian)

Pollution Prevention Guideline Annex 1C – Firefighting Foam Management

Seq	Requirement	Description	Stakeholder with potential roles or responsibilities
		If facility repair is required, <a href="#">Form AE547</a> can be completed and actioned as a priority.	
1C.2.3	Conduct regular internal audits of foam stock.	<p>Internal audits must be carried out to verify that:</p> <ul style="list-style-type: none"> <li>• A register of the types and quantities of foams held onsite is kept up to date</li> <li>• Copies of SDSs for all chemicals held onsite are located in the storage area and are easily accessible to personnel.</li> </ul>	Facility Service Delivery Personnel (Contracted / Military / Civilian)
1C.2.4	Appropriately monitor wastewater disposed of to sewer in accordance with a TWA.	<p>Monitoring of contaminants in waste discharged to sewer must be undertaken in accordance with the TWA for the site. Contamination may include BOD or COD of waste discharged to the sewer as well as other contaminants.</p> <p>Reporting requirements will also be detailed in the TWA.</p> <p>If no TWA exists, monitoring must be undertaken as agreed by the WWTP operator. This includes Defence-owned WWTPs.</p> <p>Advice can be sought from the EE Branch if monitoring requirements for a Defence wastewater treatment plan are required to be developed.</p>	Facility Service Delivery Personnel (Contracted / Military / Civilian) WWTP Operator
1C.2.5	Maintain records of the disposal of all wastewater and foam by the NWC.	<p>Records of all water / foam disposed of offsite by waste contractors must be recorded and maintained at the site.</p> <p>This must include volumes of waste removed from holding tanks and any results of testing undertaken.</p>	Facility Service Delivery Personnel (Contracted / Military / Civilian)
1C.2.6	Appropriately monitor the direct disposal of wastewater or foam to the environment (where appropriate).	<p>If waste foam or water is discharged to the environment for disposal (e.g. BFFF to appropriate ground surfaces), additional controls will need to be put in place including monitoring for any adverse effects to the environment. An ECC is required for any disposal of foam to the environment.</p> <p>Class B foams must not be disposed of to the environment.</p>	Manager of the activity Environment and Sustainability Managers
1C.2.7	Periodically review the environmental performance of Aircraft Rescue Fire Fighting (ARFF) vehicle foam	A periodic review of the environmental performance of ARFF foam storage, testing and training facilities must be undertaken in accordance with the framework set out in <b>Appendix 1C.C</b> . Specific timeframes for the review of various requirements are set out in <b>Appendix 1C.C</b> . DEHPD will review the requirements on a rolling six-monthly basis.	Facility Service Delivery Personnel (Military / Contracted)

Pollution Prevention Guideline Annex 1C – Firefighting Foam Management

Seq	Requirement	Description	Stakeholder with potential roles or responsibilities
	storage, testing and training facilities		
<b>Reporting</b>			
1C.2.3	Undertake consistent reporting on foam management across Defence.	<p>A risk-based annual audit, monitoring and reporting plan will be developed as part of the facility management plan.</p> <p>Reporting is to be brief and factual and to consist of the following:</p> <ul style="list-style-type: none"> <li>• A qualitative estimate of per cent compliance</li> <li>• Actions outstanding per performance requirement that are needed to reach 100% compliance</li> <li>• A short summary of any pollution incidents and their causes.</li> </ul> <p>Reporting should be consistent and be in accordance with any existing periodic environmental reporting practices.</p>	<p>Facility Service Delivery Personnel (Contracted / Military / Civilian)</p> <p>Site / Base Manager</p>
1C.2.4	Report all non-conformances relating to foam management appropriately.	<p>All environmental incidents and non-conformances must be reported via the Chain of Command and through GEMS. Personnel without access to GEMS should report all environmental incidents using the <a href="#">GEMS Incident Form</a>.</p> <p>If the equipment or infrastructure needs to be upgraded or replaced this can be reported using <a href="#">Form AE547</a>.</p>	<p>Site / Base Personnel</p> <p>Facility Service Delivery Personnel (Contracted / Military / Civilian)</p> <p>Site / Base Manager</p> <p>Environment and Sustainability Managers</p>
<b>Record keeping</b>			
1C.2.5	Maintain records of all monitoring and auditing activities.	<p>As a minimum, foam storage and handling facilities must maintain electronic records of the audit and monitoring documents. These may include, but are not limited to:</p> <ul style="list-style-type: none"> <li>• Construction drawings</li> <li>• Operation and Maintenance Manuals</li> </ul>	<p>Site / Base Personnel</p> <p>Facility Service Delivery Personnel (Contracted /</p>

Pollution Prevention Guideline Annex 1C – Firefighting Foam Management

Seq	Requirement	Description	Stakeholder with potential roles or responsibilities
		<ul style="list-style-type: none"> <li>• Registers</li> <li>• Risk assessments</li> <li>• Defence and third party audits</li> <li>• Monitoring program results and reports.</li> </ul>	Military / Civilian) Site / Base Manager Senior Environmental Personnel
1C.2.6	Maintain all records related to the transport and disposal of Class B foam contaminated waste for future review.	All records related to the transport and disposal of Class B foam waste (e.g. Class B foam contaminated wastewater, solids, or infrastructure) must be retained.  PFAS-contaminated wastes are considered to be Dangerous Goods Class 9. If the waste also contains other chemicals or fuel it may be classed Hazardous waste.	Facility Service Delivery Personnel (Contracted / Military / Civilian) NWC
1C.2.7	Maintain records of all waste transfers as per applicable State / Territory requirements.	Manifest records of all waste transport should be completed prior to waste movement as required by States / Territory requirements, where relevant.  Receipts supplied by the transportation contractor must be retained.	Site Base Manager  Facility Service Delivery Personnel (Contracted / Military / Civilian) NWC
1C.2.8	Maintain all training records for future review.	Foam storage and handling facilities should maintain electronic records of training completed by staff and contractors.	Site / Base Manager  Facility Service Delivery Personnel (Contracted / Military / Civilian) Site / Base WHS

### ENVIRONMENTAL INCIDENTS AND EMERGENCIES

30. The timeliness and efficiency with which Defence personnel and contractors respond to environmental incidents and emergencies will ultimately determine the amount (if any) of pollution which enters the receiving environment. **Table 1C.3** outlines environmental incident and emergency measures to prevent pollution from the use and management of firefighting foams.

31. To achieve these timely, efficient responses, a degree of planning is required, through the implementation of an Emergency Management Plan (EMP). Reporting of these incidents allows lessons to be learnt from past mistakes and incidents, and assists in preventing future environmental impacts and substantial clean-up costs. For these reasons, reporting of all environmental incidents and emergencies should be encouraged across all levels of Defence. Processes for Continual Improvement (CI) are discussed in the PPMM ([DEQMS](#)) (Ref Q).

**Table 1C.3: Requirements for Environmental Incidents and Emergencies<sup>1</sup>**

Seq	Requirement	Description	Stakeholder with potential roles or responsibilities
1C.3.1	Include actions to prevent environmental incidents and emergencies from firefighting foam management in site specific EMPs.	Refer to Base EMP for additional base-specific incident and emergency management requirements. Guidance on development of a site specific EMP can be found on the E&IG, <a href="#">Defence Base Emergency Management &amp; Incident Response</a> intranet page.	Site / Base Manager Senior Environmental Personnel Environment and Sustainability Managers
1C.3.2	Develop and incorporate pollution release measures into new and existing firefighting foam storage and handling facilities.	Contingency planning in the site / base EMP should prepare for the possibility that contaminated wastewater does leave the site and enters non-Commonwealth land. The involvement of external agencies in a responsible, pre-determined and co-ordinated fashion will greatly improve the response time to deal with a spill (thereby minimising its potential environmental consequences).	Site / Base Manager Senior Environmental Personnel Environment and Sustainability Managers
1C.3.3	Manage environmental incidents and emergencies in accordance with Defence requirements.	<p>The pollution source should be located and contained in agreement with approved procedures. Any inadvertent spills in the store will be cleaned-up by dry absorption methods with carbon-based absorption materials for AFFF products.</p> <p>During an emergency firefighting operation, where total containment of wastewater may not be achieved, the incident must be reported to the relevant Environment and Sustainability Manager, who may initiate further environmental action. The same will apply where inadvertent release of foam wastewater has occurred.</p> <p>Spill management action items and methodologies are discussed in further detail in the Defence Safety Manual (<a href="#">SafetyMan</a>) (Ref L) – <a href="#">Procedure 29 – Managing Hazardous Chemical Spills</a>.</p>	All Defence Personnel Facility Service Delivery Personnel (Contracted / Military / Civilian)

<sup>1</sup> It should be noted that this just includes environmental considerations. There are likely to be additional safety requirements.

Pollution Prevention Guideline Annex 1C – Firefighting Foam Management

Seq	Requirement	Description	Stakeholder with potential roles or responsibilities
		All environmental incidents and emergencies, whether hazardous or not, must be managed appropriately.	
1C.3.4	Contain environmental incidents and emergencies to prevent contamination of drains and waterways (as per AS).	<p>A spill kit must be maintained at all times within all areas where foams are used, handled or stored. The spill kit should contain covers / booms to protect access to drains and carbon-based absorbent materials for containing AFFF concentrate spills. Any absorbent material used to contain the spill should be disposed of in accordance with applicable State or Territory waste disposal requirements, where relevant.</p> <p>Clean-up and waste disposal procedures following a spill must be annotated on the spill kit as required in the various AS for the storage and handling of individual classes of hazardous chemicals.</p> <p>Where facilities are located adjacent to watercourses, emergency booms to prevent spread of released product should be maintained on site.</p>	All
1C.3.5	Reporting of environmental incidents and emergencies by all Defence and contractor personnel must occur in a timely and thorough manner.	<p>All Defence and contractor personnel are responsible for reporting any suspected or actual pollution event to the Environment and Sustainability Manager and their Chain of Command. All environmental incidents and emergencies must be reported through GEMS. Personnel without access to GEMS must report all environmental incidents through the <a href="#">GEMS Incident Form</a>.</p> <p>Environment and Sustainability Managers are responsible for determining whether the reported incident constitutes a pollution event that requires internal reporting. Any pollution leaving the site, must be actively managed. The Environment and Sustainability Manager must consult with the DPFASR to confirm that an incident involving PFAS should be reported to the relevant State or Territory environmental agency and other prescribed agencies in accordance with applicable State or Territory requirements.</p>	All
1C.3.6	Where an environmental incident or emergency has resulted in contamination of soil, surface water or groundwater, undertake actions to characterise and delineate the extent of the impacts.	This can be in the form of soil and water sampling, and analysis for contaminants of potential concern. This may also include contamination other than PFAS. If only a small area has been impacted, this sampling could be carried out by appropriately trained Defence environment staff. For larger areas or where groundwater is suspected to have been impacted, the investigation must be carried out by a suitably qualified person with site contamination assessment capability. Sampling methods must be appropriate for PFAS contamination. Further information regarding adopted PFAS screening criteria can be found in the <a href="#">Defence Contamination Management Manual</a> .	<p>Site / Base Manager</p> <p>Senior Environmental Personnel</p> <p>Environment and Sustainability Managers</p>



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Seq	Requirement	Description	Stakeholder with potential roles or responsibilities
		<p>Should concentrations of contaminants in soil, groundwater and surface water exceed adopted guideline values, guidance must be sought from <a href="#">DCARM</a> on the approach to manage any further investigations or remediation activities.</p> <p>Any identified contamination in the soil or groundwater must be reported in the GEMS EFM – CSR.</p>	
1C.3.7	Document and maintain evidence of environmental incidents and emergency investigations (as per legislative requirements).	Following notification of a potential environmental incident or emergency, a full assessment of the incident or emergency must be carried out. This may include the contamination assessment, if one has been undertaken.	Site / Base Manager Senior Environmental Personnel Environment and Sustainability Managers
1C.3.8	Maintain training records to demonstrate that relevant personnel are trained to manage environmental incidents and emergencies (requirement as per AS).	All relevant personnel should be trained in the EMP. Refresher training should also be provided at appropriate frequency. Records should be maintained to demonstrate that sufficient training has been undertaken.	Site / Base Manager Facility Service Delivery Personnel (Contracted / Military / Civilian) Site / Base WHS

## REGULATORY REQUIREMENTS

32. Users of foams and Environment and Sustainability Managers should be cognisant of the emerging nature of regulation in the area of PFAS-containing foams, and seek legal advice in respect of regulatory requirements if any questions emerge.
33. A wide range of legislation and other regulatory instruments enacted by Commonwealth, State and Territory governments may be applicable to the management of foams, and land / water which may be impacted by pollution.
34. Defence and its contractors are to be familiar with the relevant legislative and other regulatory requirements associated with the site activities undertaken including, Regulations, guidelines, licences, permits, consents and approvals, relevant to the State or Territory in which their site is located. Reference can be made to the Defence [Legal Obligations and Compliance Register \(LOCR\)](#) found on [DEQMS](#).
35. All personnel should seek legal advice prior to taking action that may be required by State or Territory laws, to confirm whether the relevant law is applicable to the Commonwealth and its specific activities. In some cases, there may be complex interactions between Commonwealth and State or Territory laws.
36. Current Commonwealth guidance includes the following:
- a. Intergovernmental Agreement on a National Framework for Responding to PFAS Contamination (PFAS IGA), 2018 (Ref AA)
  - b. PFAS National Environmental Management Plan Version 2.0 (PFAS NEMP 2.0), 2020 (Ref AA)

## DEFENCE GUIDANCE

37. The following Defence documents collectively support this Guideline:
- a. Defence PFAS Construction and Maintenance Framework (Ref T)
  - b. Defence Waste Minimisation Policy (Ref G)
  - c. PPMM [\(DEQMS\)](#) (Ref Q), and the following Annexes:
    - (1) Annex 1D – Pollution Prevention Guideline – Fuel and Chemical Storage and Handling
    - (2) Annex 1E – Pollution Prevention Guideline – Liquid Waste Storage and Handling
    - (3) Annex 1H – Pollution Prevention Guideline – Solid Waste Storage and Handling
    - (4) Annex 1I - Pollution Prevention Guideline – Stormwater Management
    - (5) Annex 1J - Pollution Prevention Guideline – Wastewater Treatment Plants
  - d. Defence Contamination Management Manual ([DEQMS](#)) (Ref S)

## Pollution Prevention Guideline Annex 1C – Firefighting Foam Management

- e. [Defence Pollution Prevention Quick Reference Guides](#) (Ref Q)
- f. [Defence MFPE](#) (Ref I)
- g. [SafetyMan - Procedure 06 – Hazardous Chemicals Risk Management](#) (Ref L)
- h. [RAN Marine Activities Environmental Management Plan, Procedure 18, Activity: Aqueous Film Forming Foam \(AFFF\) fire Suppression system testing](#) (REF LL).

## POTENTIAL FIREFIGHTING FOAM POLLUTANTS

38. A number of different types of foams (e.g. Class A, Class B, Training and BFFF) are used by Defence for firefighting purposes, all of which pose some risk to the environment and need to be managed appropriately. For Defence, the ongoing environmental risk lies with its management of Class B foams which can contain fluoro-surfactants or other persistent chemicals, such as PFAS, and the legacy of existing infrastructure which may be contaminated with PFAS.
39. The pollutants of concern when handling and storing fluorinated foams, including AFFF, are PFAS, which include a large range of chemicals. Some individual PFAS of particular concern to Defence include:
- a. PFOS and its precursors
  - b. PFOA and its precursors
  - c. Perfluorohexane sulfonate (PHFxS) and its precursors
  - d. Total Sum of PFAS
40. PFOS, PFHxS and PFOA, although no longer used to manufacture AFFF, may still be present in AFFF used on the estate. New stock may become contaminated from existing infrastructure and fire water or wastewater runoff from impacted surfaces which may be contaminated with PFOS and PFOA, or through the breakdown of other PFAS in the AFFF.
41. PFOS and PFOA may be present on contaminated infrastructure and equipment and any unidentified 3M Light Water stocks still left on the estate.
42. Firefighting foams which contain less environmentally hazardous constituents (eg contain short-chain PFAS or biodegradable non-fluorinated alternatives), may improve environmental outcomes where foams are stored, handled and used. The chemical constituents and breakdown products of these substances can still negatively impact the environment.
43. All foams (including Class A and B, Training and BFFF) can impact receiving environments through oxygen depletion due to COD, BOD, nutrient loading with phosphates, and acute (short-term) toxicity due to constituents such as glycols and metals. While these hazards are not as pronounced as PBT, their effects on the receiving environment can still be significant.
44. To mitigate environmental harm all foams must be managed in accordance with this Guideline.
45. **Table 1C.4** identifies some of the common pollutants associated with firefighting foams, their likely sources and the effect of the pollutant on the receiving environment.

**Table 1C.4 Firefighting Foam Pollutant Types, Sources and Effects**

<b>Pollutant</b>	<b>Effect</b>	<b>Source</b>
<b>Physicochemical</b>		
pH	<p>Increased / decreased acidity damages plants and animals.</p> <p>The impact on living tissue will depend on whether it is a strong or weak acid / alkali.</p>	<ul style="list-style-type: none"> <li>• Spillage / uncontrolled discharge</li> <li>• Firefighting activities (including training)</li> </ul>
Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD)	<p>Dissolved oxygen in water is used up more quickly than it can diffuse into the water from the atmosphere. The resulting drop in oxygen levels may be sufficient to kill fish and other aquatic organisms. If all the oxygen in the water is used up, unpleasant odours can result.</p>	<ul style="list-style-type: none"> <li>• Breakdown of foam in the environment</li> <li>• Spillage / uncontrolled discharge</li> <li>• Firefighting activities (including training)</li> </ul>
<b>PFAS</b>		
PFOS	<p>Known to be PBT, in the environment (Ref EE). Listed as a POP under the Stockholm Convention.</p>	<ul style="list-style-type: none"> <li>• Spillage / uncontrolled discharge</li> <li>• Firefighting activities (including training)</li> </ul>
PFOA	<p>Known to be PBT in the environment. (Ref DD)</p> <p>Proposed for listing under the Stockholm Convention. Considered by Australian Commonwealth Department of Health as having equivalent toxicity as PFOS for the purpose of health based guideline values.</p>	<ul style="list-style-type: none"> <li>• Spillage / uncontrolled discharge</li> <li>• Firefighting activities (including training)</li> </ul>
PFHxS	<p>Proposed for listing under the Stockholm Convention. Considered by Australian Commonwealth Department of Health as having equivalent toxicity as PFOS for the purpose of health based guideline values.</p>	<ul style="list-style-type: none"> <li>• Spillage / uncontrolled discharge</li> <li>• Firefighting activities (including training)</li> </ul>
Other PFAS (including PFHxS, 6:2 FTS and 8:2 FTS)	<p>Can be persistent in the environment.</p> <p>Can be toxic to aquatic and terrestrial organisms, and can enter the human food chain. (Ref FF).</p>	<ul style="list-style-type: none"> <li>• Spillage / uncontrolled discharge</li> <li>• Firefighting activities (including training)</li> </ul>

Pollutant	Effect	Source
<b>Other Contaminants of Concern</b>		
Heavy Metals	Poison living organisms or damage their life processes in some other way.  Can persist in the environment for a long time.	<ul style="list-style-type: none"> <li>• Protein-based foams can contain heavy metals such as zinc</li> <li>• Spillage / uncontrolled discharge</li> <li>• Firefighting activities (including training)</li> </ul>
Phosphates	Excess nutrients such as phosphates can lead to algal blooms in surface waters.  Algal blooms can deplete oxygen and produce chemical toxins.	<ul style="list-style-type: none"> <li>• Spillage / uncontrolled discharge</li> <li>• Firefighting activities (including training)</li> </ul>
Glycols	Adverse health effects in humans such as dermal and respiratory problems.  Can be acutely toxic to aquatic and terrestrial organisms.	<ul style="list-style-type: none"> <li>• Spillage / uncontrolled discharge</li> <li>• Firefighting activities (including training)</li> </ul>

### POLLUTANT FATE AND TRANSPORT

46. The key risks for Defence foam management are uncontrolled discharges of contaminated wastewaters to site / base surfaces and drains. In order to maintain firefighting capability, it is essential for Defence to train in the use and testing of foams across the estate. This constant use increases the chance of foam pollutants entering the environment.

47. The highly-mobile nature of foam pollutants, in particular PFAS, means that surface run-off from firefighting activities can result in large contamination plumes. Pollutants will often travel directly with surface water flow or migrate vertically to groundwater which is then transported with groundwater flow. PFAS can also adsorb to particulate matter and be transported in ambient air.

48. Foam contaminated infrastructure and equipment, especially concrete, can also act as a secondary pollution source, continuing to emit pollutants, well after the initial foam release.

49. The fate and transport of contaminants in the environment typically occur through complex and inter-related processes, which are condition and contaminant specific. For example factors such as rainfall, site geology / soil profile, hydrology and hydrogeology will determine the behaviour of pollutants in the environment. This behaviour can vary significantly from region to region and even from location to location within the same area. Furthermore, the soil and / or groundwater conditions also affect the extent to which natural attenuation can occur, and therefore the persistence of a pollutant in that environment.

50. **Figure 1C.1** presents typical firefighting foam pollutants fate and transport mechanisms, however, due to Defence's widely variable estate, it should not be seen as exhaustive.

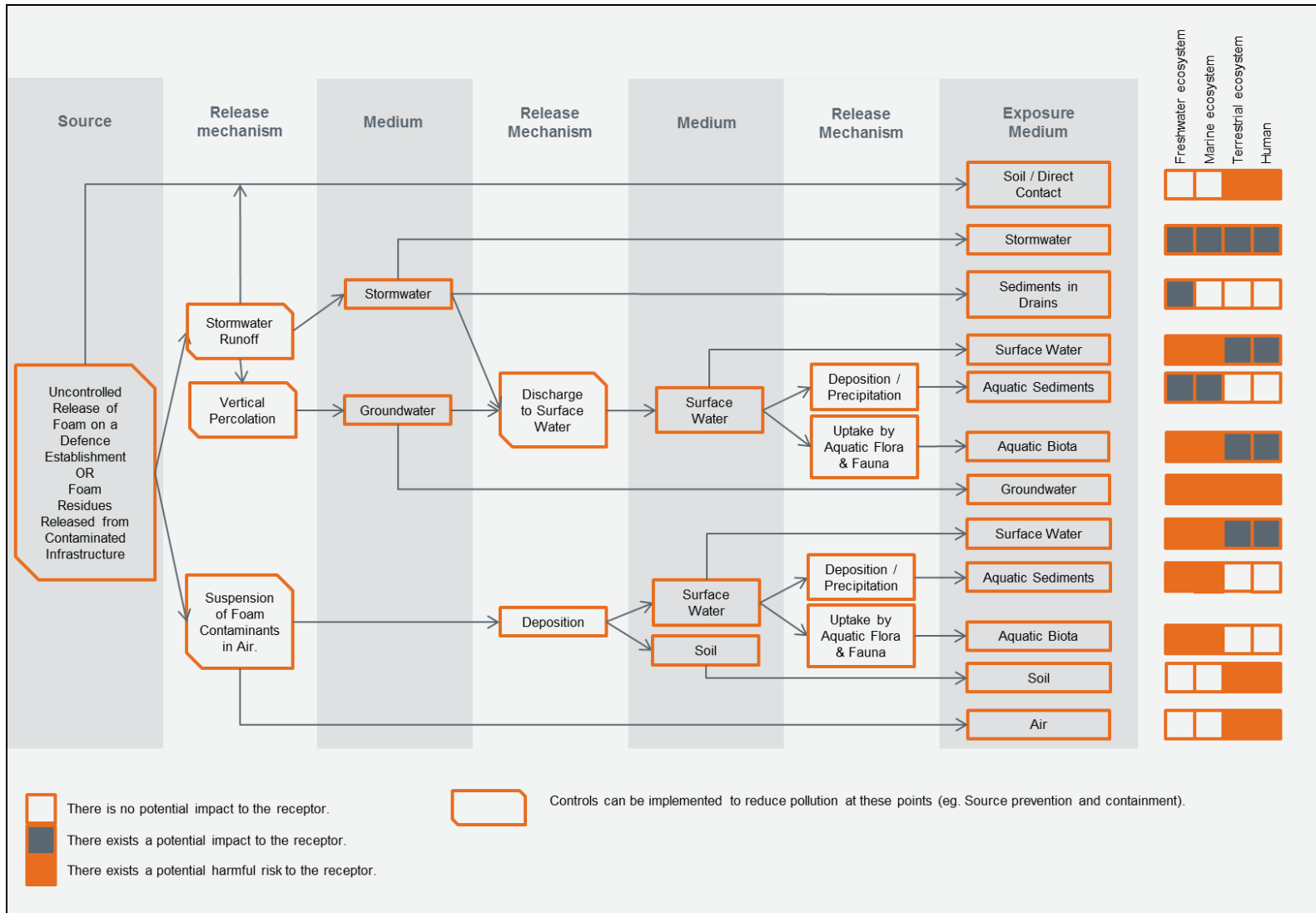


Figure 1C.1: Firefighting Foam Pollution Fate and Transport



### OTHER CONSIDERATIONS

51. This Guideline includes general environmental requirements for the management of foams. Requirements for delivery and performance of foams can be found in:
- a. [Defence MFPE](#) (Ref I)
  - b. Airport Manual, Part 1, Rescue and Firefighting, Fourth Edition (Ref CC)
  - c. [MILSPEC - MIL-F-24385F, Fire Extinguishing Agent, Aqueous Film Forming Foam \(AFFF\) Liquid Concentrate, for Fresh and Seawater](#) (Ref HH)
  - d. [RAN Marine Activities Environmental Management Plan, Procedure 18, Activity: Aqueous Film Forming Foam \(AFFF\) fire Suppression system testing](#) (Ref LL).
52. There are numerous WHS considerations associated with the management of foam concentrates and wastes. Therefore any controls outlined in the [Defence SatefyMan](#) (Ref L) must be implemented when managing firefighting foams.
53. SDSs must be present and readily available for each firefighting foam concentrate stored or handled on a site / base. Personnel must be trained and made aware of the emergency response and first aid measures associated with exposure to the concentrate being handled and stored. SDSs can be found on [ChemAlert](#).
54. Information on other environmental management topics such as surface water and groundwater quality, water management and waste minimisation can be found on [DEQMS](#).

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## APPENDIX 1C.A

### DEFINITIONS

**Active ingredient:** the part of a compound or product that produces its chemical or biological effect.

**AFFF (Aqueous Film Forming Foam):** Firefighting foam products that, when sprayed on flammable liquid fires, form a thin aqueous film at the fuel / air interface to suppress the combustion reaction, and intended for use on flammable liquid fires (Class B). Although they do not need to contain fluorinated substances to be considered an AFFF, AFFFs are typically fluorinated foams which contain PFAS in the majority of cases. All firefighting foams used by Defence must comply with Defence capability requirements: (ICAO)-B or MILSPEC - MIL-F-24385F specifications.

**BFFF (Bush Fire Fighting Foam):** Firefighting foam products specifically designed for fighting bushfires, which can also have application for other Class A fires.

**Bioaccumulation:** refers to net accumulation over time of the persistent compounds (such as heavy metals or persistent organic compounds) within an organism originating from biotic or abiotic sources.

**Bioavailability:** is the ability of a substance to be absorbed (such as environmental toxins) within a plant or an organism or to interact with its biological processes.

**Biodegradable:** refers to decomposition of a substance under natural conditions, for example breakdown by naturally occurring micro-organisms.

**BOD (Biochemical Oxygen Demand):** is a measure of how much oxygen is used up by bacteria and other micro-organisms over a stated period (generally 5 to 20 days). A lower value is desirable.

**Class A fire:** is a fire resulting from combustible solid substances.

**Class B fire:** is a fire resulting from hydrocarbon based fuels or solvents.

**COD (Chemical Oxygen Demand):** is a measure of how much oxygen is required to change a chemical to its most oxidisable state. A lower value is desirable.

**DCP (Dry Chemical Power):** complimentary Class A powder agent.

**Ecosystem (terrestrial and aquatic):** independence upon and interaction between living organisms and their immediate physical, chemical and biological environment.

**Ecotoxicity:** refers to any potential environmental impact on the ecosystem by a toxic agent.

**EC50 (Effective Concentration 50):** represents a statistically derived concentration of a toxicant that can be expected to cause a defined non-lethal effect exhibiting response in 50% of a given microbial activity under the given condition. A higher value is desirable.

**F3 (Fluorine Free Foams):** Firefighting foam products that do not contain fluorinated compounds. All firefighting foams used by Defence must comply with Defence capability requirements: (ICAO)-B or MILSPEC - MIL-F-24385F specifications.

**Fluoro-surfactant:** Constituent of fluorinated firefighting foams (e.g. PFAS).

**ICAO (International Civil Aviation Organisation):** provides specifications for fighting Class B fires.

**LC50 (Lethal Concentration 50 relating to aquatic toxicity):** where 50% of the population will survive at that concentration. A higher value is desirable.

**LD50 (Lethal Dose 50 relating to acute oral toxicity):** where 50% of the population will survive at that dose. A higher value is desirable.

**SDS (Safety Data Sheets):** contains safety and safe handling information in respect of the product, including protection information regarding human health. Some SDSs may include information on protection of the environment.

**Persistence:** is the length of time a substance stays within the environment, once introduced. This time will vary depending on if, and how readily, the substance can be broken down into other components. These components can also be toxic within the environment.

**PFAS:** Per- and poly-fluoroalkyl substances (PFAS) is a generic term used to describe chemical substances with at least one fully fluorinated carbon atom. The definition of long chain versus short chain is complicated. For example, long chain perfluoroalkyl sulfonates are those with 6 perfluorinated carbon atoms or longer (PFHxS and longer), whereas long chain perfluoroalkyl carboxylates are those with 7 perfluorinated carbon atoms or longer (PFOA and longer).

**PFHxS (perfluorohexane sulfonate):** is a fluoroalkyl surfactant used in some AFFF products.

**PFOA (perfluorooctanoic acid):** is a fluoroalkyl surfactant used in some AFFF products.

**PFOS (perfluorooctane sulfonate):** is a fluoroalkyl surfactant used in some AFFF products.

**Surfactant:** Surfactant is the abbreviation of “surface active agent” and describes any chemical that can alter the physical chemistry at the phase interfaces (e.g. between air and water, oil and water). Surfactants can be protein-based, fluorine-based or hydrocarbon-based.

**Toxicity:** the ability of a substance to cause harm in plants and animals that ingest or absorb them. This can result in death when exposed beyond a critical concentration.

**Wastewater:** water containing contaminants which requires treatment prior to discharge to the environment.

## APPENDIX 1C.B

### ENVIRONMENTAL CRITERIA FOR COMPARING FIREFIGHTING FOAM PRODUCTS

**Table 1C.B: Environmental criteria for comparing firefighting foam products**

Foam Type	Phosphorus (%)	pH (1-10)	Biochemical oxygen demand (BOD) (mg/L)	Chemical oxygen demand (COD) (mg/L)	EC50 Concentration (microbial toxicity) (mg/L)	LC50 Concentration (aquatic toxicity) (mg/L)	LD50 Concentration (acute oral toxicity) (mg/L)	PFAS	PFOS (ppb)	PFOA (ppb)	PFOS + PFHxS (ppb)
Class A (including DCP)	Products with the <u>lowest P</u> content should be selected	Preferred range of 6-8	Products with the <u>lowest</u> BOD and COD should be selected	Products with the <u>highest</u> EC50, LC50 and LD50 should be selected				Class A foam, BFFF and training foam <u>must not contain PFAS</u>			
BFFF											
Training Foam											
Class B								Class B foams <u>must not contain PFAS</u> .  <i>unless required to meet pre-existing capability or interoperability requirements, or supporting infrastructure is yet to be transitioned to utilise F3.</i>  If required to contain PFAS, the product with the <u>lowest</u> PFAS content should be selected.			

Note: explanatory notes on these terms are included in the Definitions section of this Guideline

**FRAMEWORK FOR AUTHORISING AND PERIODICALLY REVIEWING THE ENVIRONMENTAL PERFORMANCE OF ARFF FOAM STORAGE, TESTING AND TRAINING FACILITIES**

**Objective**

The aim of this document is to provide the requirements for authorising and reviewing the environmental performance of ARFF foam storage, testing and training facilities.

The review and audit requirements set out in this framework are based on the ARFF F3 Environmental Management Plan (EMP). More details on the storage and handling of F3 can be found in the EMP.

**Application**

This framework applies to all Defence and contracted ARFF services.

**Framework**

The below table indicates all monitoring and auditing requirements as set out in the EMP.

Table 1C.C: Review requirements

Review	Description	Responsible personnel	Frequency	Report to
Foam testing and storage facilities	<p>A site audit must be conducted of all foam testing and storage facilities to ensure compliance with the F3 EMP and facility SOPs. This includes:</p> <ul style="list-style-type: none"> <li>- Effectiveness of spill control system</li> <li>- Condition of facilities</li> <li>- Condition of equipment</li> <li>- Storm water runoff management</li> <li>- Any other requirements captured in the EMP and SOPs.</li> </ul> <p>Following the site audit, the responsible personnel will follow up on identified deficiencies (if necessary) and action either via maintenance procedures or the Estate Works Program.</p> <p>The results of the audit must be submitted to <a href="mailto:pollution.prevention@defence.gov.au">pollution.prevention@defence.gov.au</a>.</p>	Firefighters	Annually	<p>Station Officer</p> <p>Firefighting MGR (HQCSG)</p>
Foam storage	Ensure foam stocks are stored in	Firefighters	Monthly	Station



	accordance with EMP, SOP PPMM.			Officer Firefighting MGR (HQCSG)
Foam testing facilities	Wastewater in tank is being emptied before reaching capacity. System is working as intended, is capturing all water without any leaks.	Firefighters	Monthly	Station Officer Firefighting MGR (HQCSG)
Incidents	All incidents are logged in GEMS and reviewed by DEPHD and user units. Any possible improvements to procedures to be updated in EMP and SOP.	Personnel involved with spill DEHPD	Post incident	GEMS
Environmental Impact	All incidents will be reviewed to check whether there has been any environmental impact on or off the estate, with particular focus on sensitive environments.	DEHPD	Post-incident	N/A
Training	All personnel working with foams have completed relevant training as per EMP.	Station Officers	6 monthly	Manager
Procurement	Any F3 product procured for Defence must receive environmental approval. CASG, as the procurement authority, will contact DEHPD if a different F3 product is required for Defence. DEHPD will check at the end of each financial year that ECOPOL-A remains the only F3 product on the Defence estate	CASG – CSVSPO DEHPD	Annually	DEHPD