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Appendix F – Aircraft Crash Sites
Appendix G – Firing Ranges
Appendix H – Fire Training Grounds
Appendix I – Burning Grounds
Appendix J – Demolition
Appendix K – Management of PFAS Contamination
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Appendix M – Manual for the Management and Remediation of Petroleum Hydrocarbon
Contaminated Soil and Sediments
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### Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Meaning</th>
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<tbody>
<tr>
<td>ACM</td>
<td>Asbestos Containing Material</td>
</tr>
<tr>
<td>ACLCA</td>
<td>Australian Contaminated Land Consultants Association</td>
</tr>
<tr>
<td>ADES</td>
<td>Assistant Director Environment and Sustainability</td>
</tr>
<tr>
<td>ALGA</td>
<td>Australian Land and Groundwater Association</td>
</tr>
<tr>
<td>ASEE</td>
<td>Assistant Secretary Environment and Engineering</td>
</tr>
<tr>
<td>ASC NEPM</td>
<td>National Environment Protection (Assessment of Site Contamination) Measure 1999 (Cth) (NEPC 2013)</td>
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<tr>
<td>ASTM</td>
<td>American Society for Testing and Materials</td>
</tr>
<tr>
<td>BTEX</td>
<td>Benzene, Toluene, Ethylbenzene and Xylene</td>
</tr>
<tr>
<td>CCA</td>
<td>Copper Chrome Arsenate</td>
</tr>
<tr>
<td>CF</td>
<td>Carbon Fibre</td>
</tr>
<tr>
<td>CFI</td>
<td>Capital Facilities and Infrastructure</td>
</tr>
<tr>
<td>CH₄</td>
<td>Methane</td>
</tr>
<tr>
<td>CI</td>
<td>Continual Improvement</td>
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</table>
| Consultant   | Consultant is a person or organisation engaged by Defence under a consultancy contract to undertake a consultancy that meets the following Department of Finance criteria for reporting on AusTender:  
  a. the services to be provided involve the development of an intellectual output that assists with Defence decision-making;  
  b. the output will reflect the independent views of the consultant; and  
  c. the output is the sole or majority element of the contract, in terms of relative value and importance. |
<p>| Contractor    | Contractor is a person engaged by Defence under a contract that represents a business resource and is subject to direct management by Defence. Contractors would not normally undertake Defence roles and are engaged as an alternative to normal Defence APS employee resources. This would also apply in circumstances where the engagement of a firm is for labour hire involving specific personnel remunerated at hourly or daily rates. Defence members and Defence Australian Public Service employees are not included in this definition. |
| CRAT         | Contamination Risk Assessment Tool |
| CSM          | Conceptual Site Model |
| DCARM        | Directorate of Contamination Assessment, Remediation and Management |
| DEEESD       | Directorate of Estate Environment &amp; Energy Service Delivery |
| Defence      | Defence is the Department of Defence and the Australian Defence Force (ADF). |
| DEHPD        | Directorate of Environment and Heritage Policy Development |
| DEPAC        | Directorate of Environmental Planning, Assessment and Compliance |
| DEQMS        | Defence Estate Quality Management System |
| EAR          | Environmental Assessment Report |
| ECC          | Environmental Clearance Certificate |</p>
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Meaning</th>
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<tbody>
<tr>
<td>EE</td>
<td>Engineering and Environment Branch</td>
</tr>
<tr>
<td>E&amp;IG</td>
<td>Estate and Infrastructure Group</td>
</tr>
<tr>
<td>EIANZ</td>
<td>Environment Institute of Australia and New Zealand</td>
</tr>
<tr>
<td>EIR</td>
<td>Estate Investment Requirement</td>
</tr>
<tr>
<td>EMP</td>
<td>Environmental Management Plan</td>
</tr>
<tr>
<td>EMS</td>
<td>Environmental Management System</td>
</tr>
<tr>
<td>EOW</td>
<td>Explosive Ordnance Waste</td>
</tr>
<tr>
<td>EPBC Act</td>
<td><em>Environment Protection and Biodiversity Conservation Act 1999 (Cth)</em></td>
</tr>
<tr>
<td>EScIIS</td>
<td>Earth Science Information Systems</td>
</tr>
<tr>
<td>ESdat</td>
<td>Environmental Data Management Software</td>
</tr>
<tr>
<td>ESM</td>
<td>Environment and Sustainability Manager</td>
</tr>
<tr>
<td>GEMS EFM – CSR</td>
<td>Garrison Estate Management System Environmental Factor Management – Contaminated Site Record</td>
</tr>
<tr>
<td>HOTO</td>
<td>Handover/Takeover</td>
</tr>
<tr>
<td>HSE</td>
<td>Health Safety and Environment</td>
</tr>
<tr>
<td>HW Act</td>
<td><em>Hazardous Waste (Regulation of Exports and Imports) Act 1989 (Cth)</em></td>
</tr>
<tr>
<td>JSEA</td>
<td>Job Safety and Environmental Analysis</td>
</tr>
<tr>
<td>LOCR</td>
<td>Legal Obligation and Compliance Registers</td>
</tr>
<tr>
<td>MAH</td>
<td>Monocyclic Aromatic Hydrocarbon</td>
</tr>
<tr>
<td>MEK</td>
<td>Methyl Ethyl Ketone</td>
</tr>
<tr>
<td>MNES</td>
<td>Matters of National Environmental Significance</td>
</tr>
<tr>
<td>NEPC</td>
<td>National Environment Protection Council</td>
</tr>
<tr>
<td>NEPM Act</td>
<td><em>National Environmental Protection Council Act 1994 (Cth)</em></td>
</tr>
<tr>
<td>NEPMs</td>
<td>National Environment Protection Measures</td>
</tr>
<tr>
<td>OCPs</td>
<td>Organochlorine pesticides</td>
</tr>
<tr>
<td>OPPs</td>
<td>Organophosphate pesticides</td>
</tr>
<tr>
<td>PAH</td>
<td>Polycyclic Aromatic Hydrocarbon</td>
</tr>
<tr>
<td>PCA</td>
<td>Pre-Construction Contamination Assessment</td>
</tr>
<tr>
<td>PCB</td>
<td>Polychlorinated Biphenyls</td>
</tr>
<tr>
<td>PFAS</td>
<td>Per- and Poly-Fluoroalkyl Substances</td>
</tr>
<tr>
<td>PFASIM Branch</td>
<td>PFAS Investigation Management Branch</td>
</tr>
<tr>
<td>PM Branch</td>
<td>Property Management Branch</td>
</tr>
<tr>
<td>PPMM</td>
<td>Pollution Prevention Management Manual</td>
</tr>
<tr>
<td>PRAP</td>
<td>Project Review and Assessment Process</td>
</tr>
<tr>
<td>Stage 1 PSI</td>
<td>Stage 1 Preliminary Site Investigation</td>
</tr>
<tr>
<td>Stage 2 DSI</td>
<td>Stage 2 Detailed Site Investigation</td>
</tr>
<tr>
<td>RFS</td>
<td>Remediation Feasibility Study</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Meaning</td>
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<tr>
<td>--------------</td>
<td>---------------------------------------------</td>
</tr>
<tr>
<td>SafetyMan</td>
<td>Defence Work Health and Safety Manual</td>
</tr>
<tr>
<td>SWMS</td>
<td>Safe Work Method Statements</td>
</tr>
<tr>
<td>TCE</td>
<td>Tetrachloroethylene</td>
</tr>
<tr>
<td>TPH</td>
<td>Total Petroleum Hydrocarbon</td>
</tr>
<tr>
<td>TRH</td>
<td>Total Recoverable Hydrocarbons</td>
</tr>
<tr>
<td>UXO</td>
<td>Unexploded Ordnance</td>
</tr>
<tr>
<td>WHS Act</td>
<td><em>Work Health and Safety Act 2011</em> (Cth)</td>
</tr>
</tbody>
</table>
1. Introduction

1.1 Drivers for Contamination Management

Defence manages a large property portfolio that contains a number of known contaminated sites as a legacy of past industrial and military activities and practises. Appropriate management of these sites limits the potential for risk to human health and the environment, reduced land capability for Defence purposes, legal liability and reputational impacts.

1.2 Defence Environmental Strategy 2016-2036

The Defence Contamination Management Manual provides technical guidance to support Defence to achieve the Defence Environmental Strategy 2016-2036 - in particular Strategic Aim 3 that states that Defence will minimise future pollution risks and manage existing contamination risks. The four priorities of Strategic Aim 3 are:

3.1 Minimise future pollution and contamination risks both in Australia and in overseas operations

3.2 Understand emerging contamination risks and advances in remediation and management approaches

3.3 Apply a risk-based approach to managing contaminated sites, including unexploded ordnance, to reduce impacts to human health and the natural environment and maintain public access to key information about these risks

3.4 Manage contaminated sites and potential pollutants in accordance with relevant legislative obligations and standards

Figure 1-1 shows how the guidance for contamination management supports the Defence Environmental Strategy 2016-2036 and pollution prevention on the Estate.


1.3 Purpose

The Defence Contamination Management Manual provides an easy-to-use framework to guide the management of contamination (soil, sediment and water) during the planning and conduct of a range of Defence activities that can interact with contaminated sites, including property acquisition, leasing and divestment and asset construction/development. The Manual content is aimed at Defence personnel and contractors. It supports compliance with Defence policies as described in the Defence Environment and Heritage Manual.
Figure 1-1 Defence Contamination Management to achieve the Defence Environmental Strategy
1.4 Document Overview

The *Defence Contamination Management Manual* is supported by Annexes (A to L), which provide guidance on specific technical aspects of contamination management that are relevant to Defence activities. Figure 1-2 provides an overview of how the Manual, and supporting Annexes relate to the overarching *Defence Environment and Heritage Manual*.

This Manual should be used in combination with other relevant property management guidance and tools to support management decisions regarding the property transactions, new infrastructure or development works and pollution prevention.
1.5 Scope

The Defence Contamination Management Manual and supporting Annexes:

- Set out the requirements to manage existing contamination, including chemical contamination of soil, water and sediment. It does not consider, in detail:
  - Condition of buildings or structures, including the management of Asbestos Containing Materials (ACM) and lead paint in building fabric and infrastructure. Refer to relevant Asbestos Management Plans Estate & Infrastructure Group Asbestos Management Plan (AMP).
  - Occupational hygiene issues, such as low-level radiologic waste. Refer to Work Health and Safety Branch.
- It does not replace tailored project or site specific advice on contamination management/liability matters.

1.6 Key Roles, Functions and Responsibilities

This Manual has been prepared for use by all Defence and contract personnel. Specific stakeholders and their responsibilities with respect to the Guideline requirements outlined in each of the Annexes are included in Table 1-1 and within the Joint Framework for Base Accountabilities.

If personnel are unsure about any activity which has the potential to cause a significant impact to the environment, advice must be sought from regional environmental personnel in the first instance.

Table 1-1 Key Roles, Functions and Responsibilities

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Responsibility</th>
</tr>
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<tbody>
<tr>
<td>Department of Defence</td>
<td>Compliance with the Work Health and Safety Act 2011 (Cth), the Environment Protection and Biodiversity Conservation Act 1999 (Cth).</td>
</tr>
</tbody>
</table>
| Environment and Engineering Branch | • Development and maintenance of the Defence Contamination Management Manual, Annexes, and all related contamination policy and tools.  
• Communication of this Manual and Annexes to Estate and Infrastructure Group (E&IG) and other Groups and Services. |
| Directorate of Contamination Assessment, Remediation and Management | Training and awareness for regional environmental personnel about the requirements specified in this Manual and Annexes. |
| Base Manager | The responsibilities of the Base Manager include but are not limited to the following:  
• Communicate the requirements of the Defence Contamination Management Manual and Annexes to the relevant base personnel and contractors.  
• Liaise with regional environmental personnel to gain an understanding of the site environmental issues/risks. |
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<tr>
<th>Stakeholder</th>
<th>Responsibility</th>
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</table>
| **Assistant Director Environment and Sustainability (ADES)**               | The responsibilities of the ADES include but are not limited to the following:                                                                                      • Assist site personnel to comply with the requirements specified in the *Defence Contamination Management Manual* and Annexes.  
• Support inclusion of the requirements of the *Defence Contamination Management Manual* and Annexes in Environmental Management Plans (EMP) and Environmental Clearance Certificates (ECC).  
• Liaise with Defence including Base Managers and government authorities (eg SADFO) with respect to environmental issues/risks.  
• Advise site personnel on environmental management and remediation matters on the Defence Estate.  
• Support the co-ordination of site activities for specialist environmental consultants  
• Contribute to handover/takeover (HOTO) processes to ensure contamination issues/risks are addressed.  |
| **Environment & Sustainability Manager (ESM)**                             | The responsibilities of ESM include but are not limited to the following:  
• Support site response planning, site inspections and clean-up works as necessary.  
• Identify and communicate site environmental issues/risks to the site/base manager.  
• Support continued interpretation and compliance with the Defence Environment and Heritage Manual Policy, the *Defence Contamination Management Manual* and Annexes.  
• Ensure contamination reports, records and data are submitted and uploaded to Garrison Estate Management System Environmental Factor Management – Contaminated Site Record (GEMS EFM – CSR) and Environmental Data Management Software (ESdat).  
• Audits and inspections                                                                                                           |
| **Contract Administrators, Base Services Contractors, Design Services Consultants Other Civil Works Contractors** | The responsibilities of Contract Administrators for specialist Base Services contractors, Defence PMCA’s and Civil Works Contractors, include but are not limited to the following:  
• Scope and implement the relevant management measures identified in the *Contamination Management Manual* and Annexes.  
• Identify and allocate the resources to implement the *Contamination Management Manual* and Annexes.  
• Incorporate environmental considerations, including contamination management into all planned work through the ECC process and in CEMPs and SWMS.  
• Provide GEMS EFM-CSR estate data, when requested, to support appropriate cost planning activities.  
• Ensuring that contractors undertake appropriate project planning, obtain environmental approvals, and receive site specific environmental awareness inductions prior to work commencing.  
• Identify and communicate new environmental risks  
• Communicate the requirements to comply with the *Contamination Management Manual* and Annexes to all personnel, and subcontractors  
• Ensuring records are kept and maintained, including updates to the GEMS EFM – CSR.  
• Compliance with the relevant requirements of this Guideline, SWMS, JSEAs, Commonwealth and State legislation and other environmental management guidance as instructed by a Defence Project Manager.  
• Participation in the mandatory Defence project/site induction program.  
• Reporting on any environmental incidents.  |
An Accredited Environmental (Contaminated Land) Auditor is an individual who has been accredited by the regulatory authority in a particular State or Territory as an ‘expert’ in the field of contaminated land management and can provide independent assurance that the site has been assessed appropriately and/or has been made suitable for a specified land use.

An Accredited Environmental (contaminated land) Auditor is engaged when Defence are required to interact with a state/territory regulator and/or when an Environmental Audit is required. An Environmental Audit can be undertaken by a state based Accredited Environmental (contaminated land) Auditor when a formal independent opinion as to the contamination status of the land is required to manage contamination liabilities such as to facilitate a property divestment.

Where the property in question is Commonwealth land, a Statutory Environmental Audit, administered by the States and Territories is not applicable. In these cases, Defence may wish to request a non-statutory audit from an accredited Environmental (Contaminated Land) Auditor. Some States and Territories have reciprocity agreements that allow auditors from one State to practice in another. Environmental (Contaminated Land) Auditors will often have reporting obligations to State/Territory regulators to disclose contamination, under State or Territory legislation. Defence staff and contractors should be aware of these reporting obligations before engaging an auditor. Once engaged the Auditor may have a legal liability to the State/Territory regulators to report any offsite contamination within a specific timeframe.

Defence may also engage an Accredited Environmental (Site contamination) Auditors in the capacity of a Technical Advisor (TA) to provide independent advice to Defence on suitability of the outputs of various stage of investigation and particularly when remediation is being proposed. TAs do not liaise with the State and Territory regulators unless requested to do so by Defence. It is best practice to engage an Accredited Environmental (Contaminated Land) Auditor/TA at the earliest stage of the site assessment or investigation, where independent assurance is required.

**Technical Advisor**

A TA is generally an Accredited Environmental (Contaminated land) Auditor (as per above) and can provide independent assurance that the site has been assessed appropriately and/or has been made suitable for a specified land use.

The role of the TA is to ensure that the environmental investigations are fit for purpose in achieving the data quality/remediation objectives, demonstrate due diligence, and comply with the intent of relevant local, state and national regulatory requirements. Two key aims of the Technical Advisor role are to:

- report to Defence on whether the investigation design and conduct will sufficiently identify the nature of the contamination and delineate its lateral and vertical extent to support risk assessment and, if necessary, provide the basis for the development of an appropriate remediation or management strategy (Schedule B2 of ASC NEPM) and
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<th>Stakeholder</th>
<th>Responsibility</th>
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<td>• provide Defence and the Lead Environmental Consultant with pragmatic, responsive advice and technical guidance that can facilitate investigation and remediation to achieve established objectives.</td>
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1.7 **Asset Life Cycle Phases**

Defence has a series of business processes and procedures to manage the estate and infrastructure asset life cycle phases through the planning, acquisition, development, operation (in-service) and divestment of assets.


Contamination management measures must be integrated with each stage of the Asset Life Cycle to reduce the potential liability and risk of contamination to Defence personnel, the community and the environment. Contamination management measures for each stage of the asset life cycle are listed in Section 4 with further detail provided in Annex A – Property Transaction, Redevelopment and Divestment (Appendix A).

1.8 **Defence Documentation**

The Defence Contamination Management Manual, and associated Annexes, are supported by the following Defence documentation:

- Defence Work Health and Safety Manual SafetyMan
- Defence Smart Infrastructure Manual, Design Construction Defence Smart Infrastructure Handbook
- Defence Estate Waste Policy and Strategy 2016-2021

2. **Regulatory Requirements**

2.1 **Overview**

Key legislative instruments that guide Defence’s approach to environmental management, as well as the management of contamination include:


Defence and its contractors must operate to comply with all Commonwealth legislation, including the WHS Act, EPBC Act and the NEPM. Reference can be made to the Defence Legal Obligations and Compliance Register (LOCR) found on Defence Estate Quality Management System (DEQMS).

Defence may not be subject to State and Territory law in all situations. Whether or not Defence is bound by State and Territory law is a complex issue and legal advice must be obtained to
confirm whether a particular State or Territory law is applicable to Defence. Defence contractors must comply with relevant State or Territory laws.

Guidance relating to the assessment of site contamination is outlined in the NEPC, NEPM (as amended in May 2013).

2.2 EPBC Act

The *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) is the Australian Government’s central piece of environmental legislation. It provides a legal framework to protect and manage matters of national environmental significance.

The EPBC Act protects:

- The environment, where actions proposed are on, or will affect Commonwealth land and the environment; and
- The environment, anywhere globally on land and water, where a Commonwealth agency – including the Department of Defence – are proposing to take an action.

The EPBC Act also protects nine matters of national environmental significance:

- World heritage properties
- National heritage places
- Wetlands of international importance (Ramsar wetlands)
- Listed threatened species and communities
- Listed migratory species
- Commonwealth marine areas
- The Great Barrier Reef Marine Park
- Nuclear actions (including uranium mining)
- A water resource in relation to coal seam gas development and large coal mining development.

Defence uses a comprehensive environmental impact assessment and approval program to understand and manage the impacts of its activities on the environment and heritage, and to ensure compliance with the EPBC Act.

Under the Defence Environment and Heritage Manual, the Director of Environmental Planning, Assessment and Compliance (DEPAC) is the Defence technical authority for determining compliance with the EPBC Act. All matters that may trigger the EPBC Act are to be referred to DEPAC.

DEPAC undertakes a self-assessment against the *Significant Impact Guidelines 1.1 and 1.2* published by the Department of the Environment and Energy to determine if a ‘significant impact’ EPBC Act protected matter is likely. The self-assessment process considers the nature and extent of contamination and if the presence, disturbance, removal or remediation of existing contamination is likely to have a significant impact on EPBC Act protected matters. Where a significant impact to the environment is ‘likely’ the action must be referred to the Minister for the Environment and Energy to make a determination on whether a proposed action is a ‘controlled action’.

2.3 NEPM

The National Environment Protection (Assessment of Site Contamination) Measures 1999 (Cth) (the ASC NEPM) was made under the National Environment Protection Council Act 1994 (Cth). The ASC NEPM is the national guidance document for the assessment of site contamination in Australia. It is given effect by the National Environment Protection Measures (Implementation) Act 1998 (Cth) for the Commonwealth and individual legislation and guidelines in each State and Territory.

The National Environment Protection Council (NEPC) agreed to vary the NEPM by approving an amending instrument to the ASC NEPM in 2013.

All assessments of site contamination on the Defence Estate are to be undertaken in accordance with the recommended process and guidance provided in the ASC NEPM.

The purpose of the ASC NEPM is to establish a nationally consistent approach for the assessment of site contamination; to ensure sound environmental management practices by the community, including regulators, site assessors, site contamination consultants, environmental auditors, landowners, developers and industry parties.

The desired outcome of the ASC NEPM is to provide adequate protection of human health and the environment, where contamination has occurred, through the development of an efficient and effective national approach to the assessment of site contamination.

The ASC NEPM and schedules are available for download through the National Environment Protection Council (NEPC) website. The ASC NEPM Toolbox contains additional information including calculators, spreadsheets and other supporting documents to assist with application of the amended ASC NEPM.

2.4 Commonwealth Work Health and Safety Act 2011

The Work Health and Safety Act 2011 (Cth) (WHS Act) commenced in 2012 and is regulated by Comcare, a Commonwealth Government agency that works in partnership with the Safety, Rehabilitation and Compensation Commission. The WHS Act provides for a nationally consistent framework to protect workers and other persons against harm to their health and safety through the elimination or minimisation of the risks to the extent reasonably practicable.

Under the WHS Act, employers must take all reasonably practicable steps to ensure the health and safety of its employees and those who are at or near a workplace under the employer's control. This means that Defence and its contractors have obligations to protect the health and safety of workers and others operating within the vicinity of contaminated land that is on or near to a workplace under Defence control.

Model Codes of Practice administered by Safe Work Australia provide practical guides to achieve the standards of health, safety and welfare required under the WHS Act.

Any controls outlined in SafetyMan must be implemented when managing contaminated materials.

2.5 Environment and Heritage Manual

The Environment and Heritage Manual (EHM) (2019) describes the agreed approach to enabling Defence capability through long-term sustainable management of the environment. The EHM provides instruction and policy guidance for all Defence personnel and contractors on Defence’s legislative obligations and stewardship goals in line with the Defence Environmental Policy and Environmental Strategy 2016-2036.
The Defence Environment and Heritage Manual is an administrative policy framework document that applies to all Defence personnel.

The EHM is divided into 13 chapters addressing:

- Chapter 1 – Environment and heritage management in Defence
- Chapter 2 – Environmental assessment and approval
- Chapter 3 – Heritage management
- Chapter 4 – Domestic biosecurity
- Chapter 5 – Native species and communities
- Chapter 6 – Soil management
- Chapter 7 – Bushfire management
- Chapter 8 – Pollution prevention
- Chapter 9 – Site contamination management
- Chapter 10 – Estate water management
- Chapter 11 – Estate energy management
- Chapter 12 – Waste minimisation and management
- Chapter 13 – Estate climate adaptation

Each chapter links back to a Strategic Aim of the Defence Environmental Policy and provides supporting documentation to support the implementation of the policy. Chapter 9 addresses site contamination management.

2.6 State and Territory Regulations

A list of relevant State and Territory environmental legislative requirements has not been provided in this Manual – there are however a number of State and Territory based guidance documents listed in the reference sections of the individual Guidance Documents (Annex A to J).

Hyperlinks to the current State and Territory regulatory environmental agencies are provided below. Over time the State and Territory-based regulations are likely to be subject to review, amendments, insertions, replacement or withdrawal. Personnel should make reference to live and on-line tools displaying the latest amendments and documents in circulation for each State and Territory.

<table>
<thead>
<tr>
<th>Jurisdiction</th>
<th>Department</th>
<th>Link</th>
</tr>
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<tbody>
<tr>
<td>Federal</td>
<td>Department of Environment and Energy</td>
<td><a href="http://www.environment.gov.au">www.environment.gov.au</a></td>
</tr>
<tr>
<td>Tasmania</td>
<td>Environment Protection Authority Tasmania</td>
<td><a href="http://www.epa.tas.gov.au/epa">www.epa.tas.gov.au/epa</a></td>
</tr>
<tr>
<td>Victoria</td>
<td>Environment Protection Authority Victoria</td>
<td><a href="http://www.epa.vic.gov.au">www.epa.vic.gov.au</a></td>
</tr>
<tr>
<td>Australian Capital Territory</td>
<td>Environment Protection Agency</td>
<td><a href="http://www.accesscanberra.act.gov.au">www.accesscanberra.act.gov.au</a></td>
</tr>
<tr>
<td>New South Wales</td>
<td>New South Wales Environment Protection Authority</td>
<td><a href="http://www.epa.nsw.gov.au">www.epa.nsw.gov.au</a></td>
</tr>
</tbody>
</table>
2.7 Off-site migration

The Defence Project Manager should obtain professional advice to inform the reporting and management of any contamination that is found to have migrated off-site into a State/Territory jurisdiction. Delineating the nature and extent of the off-site contamination will assist Defence to implement appropriate mitigation measures and to manage any legal implications. A link to the various State and Territory environmental agencies can be found in the Defence Environmental Strategy, Defence Contamination Management Manual. Any interaction with State or Territory environmental regulators must only occur after first consulting the Assistant Director, Environment and Sustainability Manager or Directorate of Contamination Assessment, Remediation and Management.

2.8 General Principles

Although the contaminated land regulatory framework differs between States and Territories, there are some overarching principles that apply in the context of managing contamination risk on Defence property. These include:

- Appropriate due diligence to assess contamination risks must be conducted in planning of all Defence activities through the capability life cycle phases, including property acquisition, leasing, redevelopment, estate maintenance, operation and activities, and divestment.
- Disclosure to third parties of known property contamination prior to the lease or divestment of a Defence property, e.g. provision of recent and relevant site assessment reports to prospective purchasers.
- The liability for contamination will in most cases lie with the polluter. However, the Commonwealth as an owner, lessor or lessee of land can, through no action by the Commonwealth, be exposed to risk of liability for pollution by a third party (e.g. from contamination migrating from an adjoining property, from the illegal dumping of waste or pollution caused by a licensee).
- Legal advice is obtained for the drafting of contamination and remediation clauses, as appropriate in agreements and contracts for property acquisition, leasing, redevelopment and divestment.
- For Commonwealth interagency transfers Defence may consider engaging the services of an accredited Contaminated Land Auditor, or Technical Advisor (for low risk divestments), to provide independent assurance that the site has been appropriately assessed and is suitable for the agreed future land uses.
- For transfer or divestment of Commonwealth land to the States, Territories or local government agencies, planning authorities will consider the contamination status of land when assessing applications for development of land. Where the audit system applies, the planning authorities will use Environmental (Contaminated Land) Auditors to provide a report on the suitability of land for its proposed use. In some jurisdictions, planning...
authorities may note on the title that a site was formerly contaminated or has been remediated. In these situations, it is at the discretion of the government agency acquiring the land as to whether an Auditor is appointed; it is not a requirement of Defence at the time of transaction.

- For transfer or divestment of Commonwealth land to a third party (e.g. developer, private buyer or other non-government entity), The Contract of Sale (the Contract) will require that the Purchaser satisfies themselves that they have either undertaken their own due diligence, or are satisfied with the information contained in Defence due diligence materials. The divestment process would generally involve a Stage 1 Preliminary Site Investigation (Stage 1 PSI) and / or Stage 2 Detailed Site Investigation (Stage 2 DSI) which is then referred to in the contract. For higher risk property sales, where for example there is known significant contamination, Defence may involve an accredited Environmental (Contaminated Land) Auditor to provide independent assurance that the site has been appropriately assessed.

More information is available in Annex A – Property Transactions, Redevelopment and Divestment (Appendix A).
3. Contamination Risk

3.1 Overview

Section 3 provides an overview of contamination risk in the context of human health and the environment. Commercial risk, and potential contingent liabilities (future clean-up costs), relating to contamination are addressed in Appendix A.

The potential sources of contamination, pathways for exposure and receptors must be considered when assessing contamination risk. Where the pathway between a source and a receptor is incomplete, the exposure to chemical substances via that pathway cannot occur, but the potential for that pathway to be completed (for example, by abstraction of groundwater or a change in land use) must be considered. Where an actual, or potential, source-pathway-receptor linkage exists - termed a pollutant linkage - an investigation, assessment and/or remediation may be required to quantify/manage the contamination risk for the intended land uses.

3.2 Source

A contamination source is the location where a legacy or current activity has caused contaminants to enter an environmental system (soil, water, sediment or air). An example of a contamination source is a Defence Fuel Installation (Appendix E) or legacy waste site (Appendix D).

It is important to consider both current and historical contamination sources because Defence activities at a site may have changed over time – and this can potentially impact the nature, scale and extent of contamination at the source location.

3.2.1 Commonly Encountered Contaminants

Commonly encountered contaminants associated with Defence activities are described in Table 3-1. This list is provided to act as a general guide and is not intended to be exhaustive.

Table 3-1 Commonly Encountered Contaminants on Defence Sites

<table>
<thead>
<tr>
<th>Activity</th>
<th>Likely</th>
<th>Potential</th>
<th>Annex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legacy Waste Site (landfills)</td>
<td>• Heavy metals (arsenic, cadmium, chromium, copper, lead, nickel, zinc and mercury)</td>
<td>• Pesticides – organochlorine pesticide (OCPs) and organophosphate pesticides (OPPs)</td>
<td>D</td>
</tr>
<tr>
<td></td>
<td>• Nitrogen, ammonia, nitrate and nitrite, total phosphorus and orthophosphate, methane (CH₄) and carbon monoxide (CO), hydrogen sulphide</td>
<td>• Petroleum hydrocarbons (TPH, BTEX, phenols, Polycyclic Aromatic Hydrocarbons (PAHs), PCBs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Polychlorinated biphenyls (PCBs)</td>
<td>• Methane</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Volatile organic compounds (VOCs)</td>
<td>• Dioxins/Furans</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Asbestos and other contaminated material</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>• Unexploded Ordnance (UXO) and Explosive Ordnance Waste (EOW)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Defence Fuel Installation</td>
<td>• Petroleum Hydrocarbons (various), Monocyclic Aromatic Compounds (MAHs)</td>
<td>• Heavy metals including lead, zinc, copper, chromium, nickel and others</td>
<td>E</td>
</tr>
<tr>
<td></td>
<td>• PAH</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Chlorinated aliphatic hydrocarbons</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>• Anti-knocking∗ agents and petrol additives such as ethanol, methyl tert-butyl ether (MTBE) and lead for sites with older infrastructure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activity</td>
<td>Likely</td>
<td>Potential</td>
<td>Annex</td>
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<td>--------------------------------</td>
<td>------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>Aircraft Crash Sites</td>
<td>• Fuel (petroleum hydrocarbons)</td>
<td>• Heavy metals including lead, zinc, copper, chromium, nickel and others</td>
<td>F</td>
</tr>
<tr>
<td></td>
<td>• Advance composite materials (composite materials) such as carbon fibre (CF)</td>
<td>• Other potential explosive devices such as oxygen bottles and rocket deployed parachute systems</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• ACM</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Radioactive materials (generally low quantities)</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>• UXO and explosives residues from other aspects of military aircraft</td>
<td></td>
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<tr>
<td></td>
<td>• Per- and Poly-Fluoroalkyl Substances (PFAS),</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Live Firing Ranges and</td>
<td>• UXO and explosives residues</td>
<td>• Other metals (arsenic, copper, tin, zinc, iron)</td>
<td>G</td>
</tr>
<tr>
<td>High Explosive Impact Sectors</td>
<td>• Lead and other heavy metals (arsenic, copper, tin, zinc, iron)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• PAHs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fire Training Grounds</td>
<td>• Per- and Poly-Fluoroalkyl Substances (PFAS)</td>
<td>• UXO and explosives residues</td>
<td>H, K</td>
</tr>
<tr>
<td></td>
<td>• Heavy metals (notably lead)</td>
<td>• Metals</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• TRHs, BTEX, PAHs</td>
<td>• PCBs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• PCBs</td>
<td>• Dioxins, 4-methyl-2-pentanone, 2-hexanone, 2-butane</td>
<td></td>
</tr>
<tr>
<td>Burning Grounds</td>
<td>• Heavy metals</td>
<td></td>
<td>I</td>
</tr>
<tr>
<td></td>
<td>• Sulphates, nitrates, nitrites, nitrogen monoxide, phosphates, carbon dioxide, carbon monoxide</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Total saturated hydrocarbons (ethane, propane, butane)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• PAHs, TPHs, VOCs and Semi-volatile carbon compounds</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Dioxins, PCBs, BTEX, Chlorinated hydrocarbons, Phenols and cresols, asbestos</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Per- and Poly-Fluoroalkyl Substances (PFAS)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Demolition</td>
<td>• ACM (Asbestos cement, fibrous, mastic, resin and bitumastic)</td>
<td></td>
<td>H</td>
</tr>
<tr>
<td></td>
<td>• Lead based paint</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• PCBs</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Mercury containing wastes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• O-zone depleting substances (ODS)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Ceramic/Synthetic Mineral Fibres</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Biological/medical wastes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Treated timber products (Copper Chrome Arsenate (CCA), Alkaline Copper Quaternary (ACQ), Copper azole)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Activity

<table>
<thead>
<tr>
<th>Activity</th>
<th>Likely</th>
<th>Potential</th>
<th>Annex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explosives manufacture</td>
<td>UXO, asbestos, ammonia, nitrate, acids, sulphate, explosives compounds, (e.g. RDX; nitrotoluenes such as TNT, nitrocellulose)</td>
<td>Nitroglycerine, ether, hydrocarbons, metals, OCPs and OPPs</td>
<td>-</td>
</tr>
<tr>
<td>Administration and training</td>
<td>Asbestos, TRH, BTEX, PAH, lead (associated with fuel storage), OCPs and OPPs, solvents (including dry cleaning fluids at laundries)</td>
<td>UXO, other metals</td>
<td>-</td>
</tr>
<tr>
<td>Workshops</td>
<td>Trichloroethylene (TCE) and other solvents, TRH, TPH, BTEX, PAH, metals, paint strippers (MEK), VOCs</td>
<td>Asbestos</td>
<td>-</td>
</tr>
<tr>
<td>Airfields</td>
<td>UXO (if bombing ranges), TRH, BTEX, PAH, lead (associated with fuel storage), TCE, solvents, metals (workshops), paint strippers, PFAS</td>
<td>Other metals, OCPs and OPPs</td>
<td>-</td>
</tr>
<tr>
<td>Dockyards</td>
<td>TRH, BTEX, PAH, lead (associated with fuel storage), metals, TCE, solvents, paint strippers, asbestos, antifoulants, (associated with drydocks/slipways), tributyl-tin (TBT)</td>
<td>OCPs and OPPs</td>
<td>-</td>
</tr>
<tr>
<td>Cattle Dips</td>
<td>Arsenic and OCPs and OPPs such as DDT</td>
<td>Other heavy metals</td>
<td>-</td>
</tr>
</tbody>
</table>

### 3.2.2 Emerging Contaminants

An emerging contaminant is a chemical, or material, characterised by a perceived, potential, or real threat to human health or the environment or by a lack of published thresholds/health standards. A contaminant may also be considered "emerging" because of the discovery of a new source or a new pathway to humans or the environment (US EPA 2017).

In support of Australia’s commitment to the Stockholm Convention, Defence is committed to regular review of the chemicals and materials, used on the estate and in new capability, to ensure proactive management of the risk associated with emerging contaminants.

### 3.3 Pathway

Contamination pathways refers to both migration pathways and exposure pathways.

#### 3.3.1 Migration pathway

A contaminant migration pathway refers to the mechanism or route via which a contaminant may migrate through the environment, to a potential receptor after being released from a source. Important migration pathways include groundwater (e.g. aquifer systems), surface water (e.g. creek, river or ocean), sediment (e.g. erosion into water body) and air (i.e. particulate or gaseous emission). It is important to understand potential contaminant migration pathways from sources to receptors, when assessing contamination risk.

The surface water and the groundwater pathways are of particular importance to Defence. These pathways include:

- Surface water drainage lines, both anthropogenic (e.g. stormwater network) or naturally occurring. Surface water drainage lines may transport contaminated spoil, temporarily stockpiled in source areas, to a receptor during a rainfall event.
• Shallow and deep groundwater aquifers where there is the potential for impacted groundwater to migrate off site to adjacent human and environmental receptors.

3.3.2 Exposure Pathway

An exposure pathway refers to the process or route by which contaminants may come into direct contact with a human or an environmental receptor. Generally, exposure pathways include ingestion and dermal adsorption from contact with contaminated media, inhalation of airborne particulates or vapours and/or biotic pathways; for example bio-concentration or bioaccumulation in organisms resulting in transfer and biomagnification along food chains (ASTM 2014).

3.4 Receptor

Receptors include humans or other living organisms that are potentially exposed to (and adversely affected by) contaminants present in source areas or along contamination migration pathways (ASTM 2014).

It is important to consider actual and potential receptors both:
• On-site, for example human health receptors including Defence personnel or construction workers and ecological receptors present in both the aquatic and terrestrial environs on-site
• Off-site, for example human health receptors including neighbours and humans accessing waterways that have been impacted by contaminants moving off site and ecological receptors such as waterbodies and terrestrial environment (including EPBC Matters of National Environmental Significance such as wetlands).

3.5 Conceptual Site Model (CSM)

3.5.1 Overview

A Conceptual Site Model (CSM) describes the contamination sources, pathways and receptors and the potential linkages between these.

The initial CSM is constructed from the results of a Stage 1 Preliminary Site Investigation (Stage 1 PSI) and is the basis for defining where potential source-pathway-receptor linkages may exist, which may require further investigation. The CSM must be continually reviewed and updated throughout the assessment process to inform subsequent decisions on whether further investigation or contamination management actions are required to manage risk within thresholds.

The CSM should identify complete and potential, realistic pathways between known or potential contamination sources and receptors. Where the pathway between a source and a receptor is incomplete, the exposure to chemical substances via that pathway cannot occur, but the potential for that pathway to be completed, for example, by abstraction of groundwater or a change in land use, should be considered in all stages of assessment. The CSM will inform the management measures that could reduce the likelihood of an exposure pathway becoming complete.

The essential elements of a CSM are:
• Known and potential sources of contamination and contaminants of concern including the mechanism(s) of contamination (e.g. ‘top down’ spill or sub-surface release from corroded tank or pipe).
• Potentially affected media (e.g. soil, sediment, groundwater, indoor and ambient air).
• Human and ecological receptors.
Potential and complete exposure pathways.

For contaminated land site investigation reports (e.g. Stage 2 DSI) the CSM is to be presented as a graphic, a table or flow chart and adequately described in written text.

An example of a CSM for a Defence Fuel Installation is shown in Figure 3-1.

3.5.2 Defence Contamination Risk Assessment Tool (CRAT)

The CSM should be used to inform the assessment of risk for each contaminated site using the Defence Contamination Risk Assessment Tool (CRAT). The purpose of the CRAT is to attribute an overall risk level based on the Estate and Infrastructure Group (E&IG) risk management framework. This framework assesses the risk for a range of impact categories including financial, safety, environmental and reputational and for specified land uses, in accord with the E&IG Risk Management framework. The CRAT also factors in the routine controls that may assist to mitigate or manage contamination and to prevent complete exposure pathways from occurring. The CRAT should be updated at the completion of each contamination investigation stage to support prioritisation and planning for future investigation, management and contamination remediation.

The CRAT is an internal Defence risk assessment mechanism, The CRAT should not be applied to investigations that are being undertaken for the purpose of divestment.
Figure 3-1 Conceptual Site Model (Defence Fuel Installation)
4. **Contamination and Projects**

### 4.1 Overview

Defence personnel and contractors delivering projects across the estate may encounter a broad range of environmental and contamination issues/risks that require management. All personnel and contractors should consider the requirements of this Manual when conducting the following activities:

- Facility and infrastructure projects at known or potentially contaminated sites (refer to Appendix C to Appendix K).
- Estate works projects and maintenance activities that may interact with a contaminated site (refer to Appendix C to Appendix K).
- Acquiring, leasing, redeveloping or disposing of Defence property/land (refer to Appendix A).
- Contamination assessment, management and remediation projects to support capability development and legislative compliance and/or where there is a human health and/or ecological risk driver.
- Responses to environmental incidents (e.g. spills or discharges) or where an on-going impact from a legacy contamination source has been identified.

### 4.2 Environmental Approvals – Facility and Infrastructure Projects

Defence uses a comprehensive environmental impact assessment (EIA) process to understand and manage the impacts of its activities and projects on environment and heritage values. The specific requirements of the EIA process for each activity or project varies depending upon the degree of predicted, actual and perceived environmental risk.


EE Branch coordinates and tracks all documentation review requests tasked to the Branch through the Site Selection Board process ([Site Selection Board process](#)) and the EE Project Review and Assessment Process (PRAP) ([EE PRAP](#)). Documentation review requests are logged and commentary is recorded as objective evidence under the DEQMS. The Project Review Assessment Coordinator (PRAC) manages the PRAP.

In accordance with the Defence Environment and Heritage Manual, the Assistant Secretary Environment and Engineering (ASEE) has been delegated the responsibility to develop engineering and environmental policy to support the development and management of the Estate. EE Branch monitors and audits the delivery areas for compliance with Defence environmental and engineering policies.

4.3  Estate Works Projects

Where a potential contamination issue has been identified at a Defence site, investigation, management actions or remediation may be required to reduce or eliminate risk.

Defence personnel responsible for management of Defence land may identify whether contamination is present, or likely to be present on Defence land, by considering the following questions. If yes is answered to one or more of the following questions, then contamination is possible:

- If the site in question is a Defence-owned property, is it already listed on GEMS EFM - CSR as a contaminated or potentially contaminated site?
- Do the results of routine checks, observations and investigations indicate that there have been potential losses or inappropriate storage, handling and disposal of toxic or hazardous materials, such as fuel, munitions, chemicals?
- Are there any current or historic reports of leaks or spills, or inventory loss from either petroleum storage, distribution, and refuelling facilities, or chemical storage, particularly older underground storage tanks (UST)? Refer to Appendix E for information on Defence Fuel Installations.
- Are there areas of historic land filling or reclamation, particularly former swamps and foreshores? Refer to Appendix D for information on legacy waste sites.
- Are there current landfills or historic tips and burial pits for liquid or solid waste disposal on the facility, including disposal of any explosives ordnance or small arms ammunition? Refer to Appendix D for information on legacy waste sites.
- Have any foreign materials been discovered during demolition, excavation or construction activity on site? Refer to Appendix J for information on demolition.
- Are there any reports of areas with localised environmental effects with no apparent cause?

If contamination is suspected, a Pre-construction Contamination Assessment (PCA) or Stage 1 PSI is likely to be warranted to confirm the findings and assess the significance of the suspected contamination (refer to Appendix B - Contamination Investigation, Remediation and Management).

4.3.1  Environmental Clearance Certificates

An ECC is required before any construction, site investigation (e.g. sampling involving disturbance of ground), demolition, use or operation of any new capability or equipment can commence.

The ECC contains the project-specific conditions and safeguards to ensure so far as reasonably practicable that environmental impacts, including contamination, are removed or minimised. Defence personnel and contractors should refer to the ECC and any Construction EMP/s for relevant contamination management requirements.

4.3.2  GEMS

The Garrison and Estate Management System (GEMS) is a single, integrated system to manage the Defence estate and service delivery and support the Defence Estate Life Cycle.

As a part of the Defence SAP system, GEMS will provide a single source of information for all estate management activities. This includes a consistent and centralised set of processes, increased automation of estate management work.
The main functions used by GEMS are Real Estate, Estate Maintenance, Environmental Health and Safety Management for Hazards and Incidents (EHSM), Environmental Factor Management (EFM), Environmental Performance Compliance, Case Management, Risk Management and Portfolio, and Project Management.

GEMS supports the following business functions and processes in Table 2.

Table 2  GEMS Business Functions & Processes

<table>
<thead>
<tr>
<th>Business Functions</th>
<th>Business Processes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estate planning</td>
<td>Contract management</td>
</tr>
<tr>
<td>Estate financial programming</td>
<td>Financial management</td>
</tr>
<tr>
<td>Acquisitions, leasing and disposals</td>
<td>Program planning and management</td>
</tr>
<tr>
<td>Major capital facilities development and delivery</td>
<td>Project management</td>
</tr>
<tr>
<td>Public Private Partnership facilities projects</td>
<td>Works processing</td>
</tr>
<tr>
<td>Estate operations including repairs and maintenance</td>
<td>Notifications and communications</td>
</tr>
<tr>
<td>Land management services</td>
<td>Risk management</td>
</tr>
<tr>
<td>Waste management</td>
<td>Performance management</td>
</tr>
<tr>
<td>Environmental management services</td>
<td>Reporting and analysis</td>
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<tr>
<td>Hospitality and catering</td>
<td></td>
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<tr>
<td>Estate technical governance and compliance</td>
<td></td>
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</tbody>
</table>

Refer to DCMM Annex L, Section 3 for guidance in relation to the management and application of the GEMS EFM-CSR.

4.3.3  Regional Defence Personal

Regional Defence personnel, including ADES and Environment and Sustainability Managers (ESMs) are an important source of local knowledge about site contamination and can provide other relevant information to Defence Project Managers and Project Consultants.

4.3.4  Site Selection Process and Estate Works Program

A contamination investigation and/or remediation project may be triggered by the site selection process for a redevelopment project, infrastructure design and development, due diligence to support property acquisition and divestments or as part of the ongoing national programs of contamination investigation and remediation to address high-risk sites on the Defence estate. The Defence site selection process is available at: [http://www.defence.gov.au/estatemanagement/lifecycle/siteselection/default.asp](http://www.defence.gov.au/estatemanagement/lifecycle/siteselection/default.asp).


4.3.5  Active contamination management

The implementation and operation component of the Defence EMS is to undertake the actions identified through the planning process. The majority of environmental management actions and controls will be implemented at the operational level. The facility for implementation of contaminated land programs at the operational level is by EMPs. EMPs must provide clear guidance and serve as reference for the relevant project stakeholders. EMPs must be:

- Developed and documented through a systematic and consultative process.
- Prepared by the program owner with technical input from project sources which may include representatives from DCARM, ADES, base stakeholders, consultants, contractors and comment from relevant regulatory agencies if applicable.
- Prepared in a consistent style and format.
- Implemented by the program owner.

### 4.3.6 Case studies

Case studies that communicate how contamination risks can be managed for facility and infrastructure projects are available in Appendix C to Appendix K.

### 4.4 Exercise/Training Planning and Contamination Management

Planning for exercise and training activities on the estate must take into consideration potential interaction with contaminated sites and management action to protect human health and the environment.

Consultation with the regional Defence personnel and review of the GEMS EFM-CSR are required to inform planning of exercises and training activities across the estate.

Any contamination incidents that occur as a result of exercises and training must be reported in accordance with the Incident Reporting available on DEQMS.
4.5 Property Transaction, Redevelopment and Divestment

4.5.1 Risks associated with property management

Defence manages a large property portfolio that contains a number of contaminated and potentially contaminated sites as a legacy of past industrial and military activities and practices. In addition to the management of this property portfolio, Defence also undertakes acquisition of new sites, leasing (as Lessor or Lessee) of sites, site redevelopment and site divestment. Risks associated with these activities include:

- **HSE Risk** – Historical site activities have potentially caused contamination that can pose a human health risk to current and/or future site users, particularly if the site changes to a more sensitive land use (i.e. commercial to recreational) or where contamination is not being appropriately managed to support existing land uses.

- **Financial and Reputation Risk** – Entering into a property acquisition or lease agreement without having undertaken some level of environmental due diligence may expose Defence to a future clean-up liability and/or reputational risk.

- **Defence Capability** – Project delays and remediation costs associated with managing unexpected contamination during property re-development can have an impact on Defence capability.

4.5.2 Management measures

Appendix A provides guidance on managing risks associated with contamination during the acquisition, leasing, redevelopment and divestment of Defence land/property. A summary of the requirements that must be followed for management of contamination risk are:

- Consideration of contamination risk and management at each stage of the Asset Life Cycle, namely Planning, Acquisition, Development, Operation and Divestment.

- Use the checklists for property acquisition, property leasing, property development and divestment (refer to Appendix A, B, C and D of Appendix A).

- For land acquisition, undertake a level of contamination assessment during the due diligence process that is commensurate with the risk. Refer to Section 4.6 and Appendix B for the levels of assessment.

- Where Defence is the lessor of a site, establish a contamination baseline (via environmental sampling and analysis) and consider a “make good” clause, or alike, in the lease agreement.

- Disclosure to third parties of known property contamination prior to the lease or divestment of a Defence property, e.g. provision of recent and relevant site assessment reports to prospective purchasers.

- Data and reports generated as part of property transaction, redevelopment and divestment activities are to be captured in the GEMS EFM – CSR.

- Engagement of a legal services provider from the Defence Legal Services Multi User Panel, to develop, review and have appropriate input into property acquisition, lease and divestment agreements.

4.5.3 Case studies

Case studies that communicate how contamination risks can be managed in property transactions, redevelopment and disposal are presented in Appendix A.
4.6 Contamination Management Projects

4.6.1 Investigation, Assessment and Remediation Types

Defence uses a sequence of contamination investigation, assessment and remediation stages to manage contamination risk. These steps are broadly aligned with ASC NEPM and include:

- Pre-construction Contamination Assessment (PCA)
- Stage 1 Preliminary Site Investigation (Stage 1 PSI)
- Stage 2 Detailed Site Investigation (Stage 2 DSI)
  - Soil Assessment
  - Groundwater Assessment
  - Sediment Assessment
- Stage 3 Risk Assessment/Remediation Design
  - Remediation Options Assessment
  - Remediation Feasibility Study (RFS)
  - Remediation Action Plan
- Stage 4 Remediation/Management
- Stage 5 Further Management Action (e.g. on-going monitoring)

Further technical detail with regard to each stage is provided in Appendix B.

4.6.2 Initiating a contamination project

Defence personnel responsible for the initiation of a contamination investigation or remediation project can consult with DCARM where required. The following minimum requirements apply to the initiation of any contamination project:

- Review of existing data and information and relevant documents on GEM EFM – CSR
- Development of an appropriate Statement of Requirement (SOR) and tender request based on accepted Defence templates and formats. The SOR must include a clear statement of the objectives for the project, Defence requirements and the intended future use of the site, where known or NEPM land use criteria that the site is being assessed against.
- When delivery of the project is outsourced, the contractor should consult with regional environmental personnel, the sponsor of an Estate Investment Requirement (EIR) and/or DCARM to confirm the scope and the required deliverables.
- Consultants requested by Defence to tender on contamination projects should, so far as is reasonably practicable, be sourced from the Defence Environment and Heritage Panel.
- All environmental consultants that are invited to tender for any contamination projects on the Defence estate must have proven relevant experience, professional expertise and membership with a relevant professional organisation such as the Australian Contaminated Land Consultants Association (ACLCA), Australian Land and Groundwater Association (ALGA) or Environment Institute of Australia and New Zealand (EIANZ).
- The selected Consultant’s project team must be appropriately qualified and experienced.

DCARM can advise if a Technical Adviser or an accredited Environmental (Contaminated Land) Auditor independent of the Consultant is also recommended for a project (refer Annex B Section 3.14).

The Contamination Management sequence that typically applies to contamination management across the Defence asset life cycle is described in Figure 4-1. Further information is available on DEQMS.

It is not always necessary to commence a contamination project at Stage 1 if sufficient current data and information is available that can inform your project objectives and if the previous investigations were conducted in the same locality of interest. For example, if a whole of base Stage 1 PSI was completed in the last 5 years on a base that has not been the subject of major
upgrades in that time, it is likely to contain sufficient site history and environmental context to guide development of a Stage 2 sampling and analysis plan or PCA scope. All Stage 1 and Stage 2 reports are available on GEMS EFM – CSR.
Figure 4-1 Contamination Management Sequence
4.7 Environmental Incident Response

Environmental incidents that relate to contamination can include:

- Spills of hazardous liquids or chemicals (e.g. fuels, corrosive cleaning chemicals, solvents)
- Leakage of hazardous liquids or chemicals from storage areas.
- Explosion or fire
- Vehicle collision resulting in loss of fuel to ground
- Temporary facilities that result in loss of chemicals to ground such as training area refuelling points, loading and unloading areas of chemicals, ablation facilities that have lost product to the environment
- Poorly managed works that disturb contaminated soil, groundwater and/or acid sulfate soils
- Uncontrolled demolition of infrastructure that contains hazardous materials, such as asbestos and lead paint

If residual impact is detected following the immediate incident response, a contamination investigation, remediation and/or other management response may be necessary. The recommended sequence for approaching assessment and management of the contamination is as outlined in Section 4.6 and Figure 4-1 and may include:

- An incident site contamination investigation including soil sampling and analysis to delineate the extent of soil contamination (laterally and vertically).
- Management of impacted soil may include:
  - In-situ management
  - Excavation and soil characterisation for treatment and/or reuse on-site or off-site disposal (refer to Appendix C)
- A groundwater investigation may be necessary if the incident releases a large volume of liquid from spilled chemicals such as solvents or fire-fighting liquids, and where the site setting is known to include shallow groundwater (<2 m below ground level) and/or have impacted on highly permeable soils (e.g. sand).
- Surface water or sediment sampling if initial observations indicated that there was impact or potential impact to a surface water body

Detailed guidance on incident response is available in the DEHPD, Pollution Prevention Program – Guideline on Environmental Emergency Response.
5. Contamination Management Tools

5.1 Overview

Defence has developed several tools to provide a framework, and consistency, to the management and reporting of contamination across the Defence estate. These tools include:

- DCMM Annex and supporting documentation
- Pollution Prevention Management Manual and supporting annexes
- GEMS EFM – CSR
- CRAT
- Environmental Data Management Software (ESdat)
- Defence PFAS Construction and Maintenance Framework – Guidance for managing the risks of PFAS contamination for works on the Defence estate (Defence PFAS Construction and Maintenance Framework)
- PFAS Engineered Stockpile Facility Performance Specification

5.2 GEMS Environmental Factor Management – Contaminated Site Record

The GEMS EFM - CSR (is a repository for information and reports about the status of contamination on the Defence estate and provides access to all available contamination investigation reports for Defence properties. It will continue to be developed and updated by Defence as sites are progressively characterised and remediated/managed.

Specifically the GEMS EFM – CSR provides a source of site-specific contamination information, including:

- Site histories
- Geo-referenced location of identified contaminated, or potentially contaminated, sites
- Information on the types of contaminants that exist or potentially exist at a contaminated site, with associated concentrations
- Documents, including previous investigation and validation reports and a site plan

Further guidance on use of the GEMS EFM – CSR is available at [GEMS EFM - CSR].

The contaminated site records in GEMS EFM need to be created (for new contaminated sites) or updated in the GEMS EFM – CSR following the completion of any new contamination investigation on the Defence estate. In most cases, the creation or update of a contaminated site record should be triggered by completion of a risk assessment using the CRAT.

5.3 Contamination Risk Assessment Tool (CRAT)

The purpose of the CRAT is to provide a tool and guidance to consultants in assessing the risks associated with Defence contaminated sites. The CRAT has been developed to be aligned with the National Environment Protection (Assessment of Site Contamination) Measure 1999 (Cth) risk based approach and the E&I Risk Management Framework [www.defence.gov.au/estatemanagement/governance/risk/Default.asp].
All Stage 1 PSI and Stage 2 DSI should apply the CRAT to assess the risks, where appropriate. Conducting a contamination risk assessment is not necessary where the Stage 1 PSI confirms there are no contamination risks on the property or for a minimal scope PCA that is only being undertaken to characterise soil for disposal (eg installation of linear services infrastructure).

5.4 Environmental Data Management Software (ESdat)

ESdat is a specialist environmental database system; used to validate, import, analyse and report a broad spectrum of environmental data as exceedance tables, graphs, maps, statistics and more.

Defence uses a cloud-based version of ESdat, hosted by Earth Science Information Systems (EScIS), which has been developed to host the contamination assessment data collected from across the Defence estate in a centralised location. The database is managed by DCARM and the PFAS Investigation Management Branch (PFASIM Branch). ESdat will support Defence’s capability to control, provide access to, and interpret environmental investigation and monitoring data, and to inform the future environmental program.

In 2017, Defence purchased ESdat to control, analyse, report, and export environmental data generated through preliminary and detailed site investigations and human health and ecological risk assessments. The use of ESdat will facilitate Defence’s ability to manage and analyse environmental data from investigations being undertaken across the Estate.

Over time, contractors and consultants that collect and analyse environmental data during projects to investigate, assess and remediate contamination will have the ability to access the Defence ESdat database to review and use data associated with their projects.

5.5 Guidance Documents

5.5.1 Contamination Management

The Defence Contamination Management Manual is supported by Annexes (A to L), which provide guidance on specific topics relating to contamination. These topics have been selected based on feedback from various Defence Groups and contractors and include:

- Annex A – Property Transactions, Redevelopment and Divestment (Appendix A)
- Annex B – Contamination Investigation, Remediation and Management (Appendix B)
- Annex C – Stockpiles and Reuse of Contaminated Material (Appendix C)
- Annex D – Legacy Waste Sites (Landfills) (Appendix D)
- Annex E – Defence Fuel Installations (Appendix E)
- Annex F – Aircraft Crash Sites (Appendix F)
- Annex G – Firing Ranges (Appendix G)
- Annex H – Fire Training Grounds (Appendix H)
- Annex I – Burning Grounds (Appendix I)
- Annex J – Demolition (Appendix J)
- Annex K – Management of PFAS Contamination (Appendix K)
- Annex L – Data Management (Appendix L)
- Manual for the Management and Remediation of Petroleum Hydrocarbon Contaminated Soil and Sediments (Appendix M)
- Guidelines for Consideration of Sustainability in Remediation of Contaminated Sites (Appendix N)

5.5.2 Pollution Prevention

Defence Pollution Prevention Management Manual and Annexes:
• Annex 1A - Acid Sulfate Soils Management
• Annex 1B - Copper Chrome Arsenate Treated Timber
• Annex 1C - Fire Fighting Foam Management
• Annex 1D - Fuel and Chemical Storage and Handling
• Annex 1E - Liquid Waste Storage and Handling
• Annex 1F - Maintenance and Cleaning Activities
• Annex 1G - Open Burning Grounds and Incineration
• Annex 1H - Solid Waste Storage and Handling
• Annex 1I - Stormwater Management
• Annex 1J - Wastewater Treatment Plants
• Annex 1K - Heavy Metals on Live Firing Ranges
• Annex 1L – Routine Water Quality Monitoring

6. Consultation and Liaison

Defence places a high level of importance on consultation and liaison with Defence stakeholders and with the Australian public about how we manage contamination risks.

6.1 Communication within Defence

DCARM is the policy owner for contamination management for Defence and is responsible for contamination policy and management guidance for contamination matters across the Defence estate.

DCARM is responsible for communicating to the Defence Environmental Management Forum on how Defence is progressing actions to achieve strategic aims in the Defence Environmental Strategy and Defence Estate Strategy, including the risk based contamination investigation and remediation program.

The Defence regional environmental personnel, base personnel and contractors are responsible for reporting contamination incidents, responding to enquiries about base level contamination matters and the provision of site and project specific contamination advice to infrastructure development and estate works through the Project Review and Assessment Process and the ECC process.

The Property Management Branch (PM Branch) is responsible for external and internal communication on contamination matters that relate to the acquisition and leasing or divestment of Defence land in consultation with regional environmental personnel or DCARM.

Capital Facilities and Infrastructure (CFI) Branch is responsible for ensuring that infrastructure design and project development proceeds with an informed understanding of site contamination matters to minimise future liabilities.

Directorate of Estate Environment & Energy Service Delivery (DEEESD) is responsible for the routine water quality monitoring program across the Defence Estate and reporting and documentation of the outcomes of this reporting to GEMS and ESdat.

6.2 Communication with Regulatory Authorities

The National Environmental (Movement of Controlled Waste between State and Territories) Measure 1999 (Cth) (Measure), regulates the movement of controlled waste between States and Territories. Controlled wastes are listed in Schedule A to the Measure. Where Defence is transporting controlled waste between States or Territories, a consignment authorisation from the State or Territory where the controlled waste is being moved to is needed.

The Hazardous Waste (Regulation of Exports and Imports) Act 1989 (Cth) (HW Act) regulates the import to and export from Australia and transit of hazardous waste. The HW Act does not regulate movements of hazardous waste within Australia. Hazardous waste, for the purposes of the HW Act, include wastes that are mentioned in Annex III of the Basel Convention. An application for an authorisation to import or export hazardous waste is required to be made to the Minister.

There are State/Territory and local jurisdictional requirements for licensing or tracking waste. Defence personnel and contractors must liaise with the relevant authority about the requirements for movement of hazardous/contaminated materials or waste to off-site waste and processing facilities. This is important even if Defence has engaged an independent contractor to move the hazardous/contaminated materials or waste.
Any interaction with State or Territory environmental regulators must only occur after first consulting with DCARM and where appropriate regional environmental personnel. Defence personnel should seek legal advice to confirm that a State or Territory law is applicable to the Commonwealth and its specific activities.

6.3 Communication with Community Stakeholders

The NEPM Schedule B8 Guideline on Community Engagement and Risk Communication (NEPM Schedule B8) provides guidelines for undertaking community consultation and risk communication in relation to the assessment of contamination.

Community engagement for activities conducted under the NEPM is a core principle of site contamination assessment. Maintaining public access to information about contaminated sites on the Defence estate is also a Defence priority expressed in both the Defence Environmental Strategy and the Defence Estate Strategy.

Under the NEPM there is a commitment by all parties (including the Australian government) to public disclosure of all site contamination information, to the extent it does not detract from any obligation of disclosure, which may exist at law. That is Defence, as an Australian government agency, has committed itself through the NEPM to disclose contamination information. Clearly such activities would need to go hand-in-hand with public awareness-raising activities in order to ensure fully informed engagement with the community.

In accordance with the NEPM Schedule B8, the following benefits can be gained by Defence through undertaking a consultative process with the community:

When managed well, community engagement and risk communication can benefit the assessment and management of site contamination by helping site managers to:

- understand public perceptions and concerns, and more accurately anticipate community response to actions and decisions
- increase the effectiveness of risk management decisions and empower the community by involving them
- improve communication and trust and reduce unwarranted tension between the wider community and decision-makers
- explain risk more effectively, to ensure that the community gains a more accurate understanding of the risks

Defence maintains a number of publically accessible Contamination Fact Sheets that describe the contamination status of most Defence properties. In addition, a number of project specific web pages provide detailed information on Defence infrastructure project and divestments that involve contamination investigation and remediation.
User Feedback

Personnel are encouraged to provide feedback on the Defence Contamination Management Manual and Annexes. Feedback will be used to inform future versions of this document, which is reviewed at regular intervals as part of the DEQMS Continual Improvement (CI) process.

Provide any feedback on this Guideline via email to environmentandheritage@defence.gov.au. Please include the Guideline title in the subject line of email/feedback.
8. References


Defence Contamination Management Manual Annexes:

- Annex A – Property Transactions, Redevelopment and Divestment
- Annex B – Contamination Investigation, Remediation and Management
- Annex C – Stockpiles and Reuse of Contaminated Material
- Annex D – Legacy Waste Sites (Landfills)
- Annex E – Defence Fuel Installations
- Annex F – Aircraft Crash Sites
- Annex G – Firing Ranges
- Annex H – Fire Training Grounds
- Annex I – Burning Grounds
- Annex J – Demolition
- Annex K – Management of PFAS Contamination
- Annex L – Data Management

Defence Pollution Prevention Management Manual and Annexes:

- Annex 1A - Acid Sulfate Soils Management
- Annex 1B - Copper Chrome Arsenate Treated Timber
- Annex 1C - Fire Fighting Foam Management
- Annex 1D - Fuel and Chemical Storage and Handling
- Annex 1E - Liquid Waste Storage and Handling
- Annex 1F - Maintenance and Cleaning Activities
- Annex 1G - Open Burning Grounds and Incineration
- Annex 1H - Solid Waste Storage and Handling
- Annex 1I - Stormwater Management
- Annex 1J - Wastewater Treatment Plants
- Annex 1K - Heavy Metals on Live Firing Ranges
- Annex 1L – Routine Water Quality Monitoring

NEPC, National Environment Protection (Assessment of Site Contamination) Measure 1999 (Cth) (as amended in May 2013).

Appendix B – Contamination Investigation, Remediation and Management
Appendix C – Stockpiles & Reuse of Excavated Material
Appendix D – Legacy Waste Sites (Landfills)
Appendix E – Defence Fuel Installations
Appendix F – Aircraft Crash Sites
Appendix G – Firing Ranges
Appendix H – Fire Training Areas
Appendix I – Burning Grounds
Appendix J – Demolition
Appendix K – Management of PFAS Contamination
Appendix M – Manual for the Management and Remediation of Petroleum Hydrocarbon Contaminated Soil and Sediments
Appendix N – Guidelines for Consideration of Sustainability in Remediation of Contaminated Sites