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Defence’s capability is intrinsically linked to an efficient and effective Defence Estate.

Resources such as energy and water are an essential input to all Defence activities, not only maintaining air-craft, ships and vehicles, but to house, power and maintain facilities used by our people.

Defence’s Major Capital Facilities Program invests over $1 Billion annually to upgrade and support capability. With this ongoing investment Defence cannot afford to lock its infrastructure into an inflexible and inefficient pathway. The Defence Estate must be positioned on a trajectory that makes the most of smart and innovative design that meets user requirements, while optimising costs over the infrastructure’s Whole-of-Life (WOL).

Defence is currently undertaking a significant resource management reform agenda through the Estate Energy and Water Policies and Estate Energy and Water Strategies. Part of this reform is the Smart Infrastructure Manual: Design and Construction.

This Manual aims to continuously improve the efficiency, effectiveness and sustainability of the Defence Estate and is a vital element in Defence’s broader resource management framework. These requirements coupled with Defence’s National Sub-metering Program and associated Resource Data Management System allows Defence to build an understanding of ongoing ‘actual’ facility performance against a baseline.

The Smart Infrastructure Manual provides benefits to both Defence and Industry involved in delivering and managing the Defence Estate. This Manual will:

- enable infrastructure delivery to be linked to operational performance
- provide clear and consistent direction to Industry on Ecologically Sustainable Development (ESD) and WOL expectations
- drive WOL cost savings through standardised monitoring
- facilitate efficient capture of lessons and opportunities that will build corporate knowledge and inform future policy and design and
- promote innovation as Industry is encouraged to provide options that exceed these requirements.

Both Defence and Industry have an important role to work collaboratively and ensure our infrastructure optimises resource management opportunities while maximising return on investment over the asset’s useful life.

The opportunities delivered through this Manual will contribute to an Estate that efficiently, effectively and sustainably continues to support capability and ultimately Defence’s mission to defend Australia and its national interests into the future.

Steve Grzeskowiak
Deputy Secretary Defence Support and Reform

Greg Divall
Head Infrastructure
1. **INTRODUCTION**

1.1 **Aim**

The aim of the Smart Infrastructure Manual is to continuously improve the efficiency, effectiveness and sustainability of the Defence Estate.

1.2 **Policy Objectives**

During infrastructure design and delivery the Smart Infrastructure Manual: Design and Construction (Smart Infrastructure) will achieve this aim by meeting the following objectives:

1) State Whole-of-Life (WOL) and Ecologically Sustainable Development (ESD) requirements as design inputs.
2) Facilitate the consistent assessment and implementation of design options on an ESD and WOL basis.
3) Detail the reporting requirements to monitor the application of ESD and WOL requirements during a project.
4) Establish the metrics and measurement systems required to support resource performance monitoring over the infrastructure’s WOL.
5) Utilise ESD and WOL project reporting to build corporate knowledge and enable Defence to:
   a) drive future policy development
   b) communicate implemented ESD and WOL initiatives and
   c) direct resources to support projects which have higher ESD and WOL opportunity.

The monitoring and evaluation of Smart Infrastructure will involve measurement against these five objectives.

1.3 **Application**

It is a requirement that:

- Smart Infrastructure is applied to all projects in the Major Capital Facilities (MCF) Program
- clauses that cannot be met or are deemed not applicable are justified and the reasons and their acceptance by Defence¹ recorded in design reports and/or contractor reports and
- every project reports against the Smart Infrastructure requirements at each design review stage using the electronic Smart Infrastructure Manual Checklist (Checklist hereafter) and at Construction Completion.

All clauses shall be addressed in the design unless explicitly stated otherwise in the Design Brief². Smart Infrastructure shall not be applied retrospectively.

1.4 **Precedence**

Smart Infrastructure does not replace any Commonwealth, State or Territory legislation (which imposes a greater requirement). The order of precedence is as follows:

- Commonwealth, State or Territory legislation and regulations
- Australian Government’s Energy Efficiency in Government Operations (EEGO) Policy
- Smart Infrastructure.

1.5 **Strategic Driver**

Smart Infrastructure is a key policy document and is Defence’s mechanism to integrate ESD into the built environment. It is driven by the following Defence Strategies (sourced from the Defence Estate Quality Management System (DEQMS)):

- Defence Environmental Policy and Environmental Strategy (DES)

The requirements in Smart Infrastructure are aligned with the ESD principles defined in the glossary of terms in Capital Facilities and Infrastructure (CFI) Branch’s suite of Contracts. These principles should also be reflected in a Service Provider’s ESD and WOL Plan.

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¹ Whether the Defence Project Officer or Contract Administrator, as applicable.

² Whether the Design Brief is for the designer, managing contractor or design and construct contractor.
1.6 Broader Policy Context

1.7 Sponsor
This document is sponsored by the Directorate of Energy Efficiency, Environmental Resource Management and Sustainability (DEEERMS) on behalf of the Technical Authority Assistant Secretary Environment and Engineering (ASEE). This document will be systematically reviewed by DEEERMS and can be accessed from the DEQMS website. The most current version of Smart Infrastructure shall be referred to when developing the Design Brief. Enquiries may be directed to:

Director Energy Efficiency, Environmental Resource Management and Sustainability
Brindabella Business Park
Canberra ACT 2600
Tel: (02) 6266 8209
Email: Smart.Infrastructure@defence.gov.au

2. APPROACH
2.1 Requirements

Objective 1 – State WOL and ESD requirements as design inputs.

Smart Infrastructure contains requirements that shall be met or exceeded but is not exhaustive. These requirements shall be viewed as part of a broader approach which includes the integration of additional ESD initiatives, strategies and resource intensity performance targets to maximise site specific opportunities, whilst meeting project requirements. These initiatives and strategies shall demonstrate industry better-practice and innovation, and be justifiable on a WOL basis. Where individual opportunities achieve a simple payback within seven years, against the base case, they are to be implemented. This approach shall be reflected in the ESD and WOL Plan prepared by the Service Provider for a project.

During design development the outcomes of this approach shall be tracked and reported using the Checklist (available from DEQMS).

2.1.1 Roles and Responsibilities

The target audience for Smart Infrastructure are those responsible for designing and/or delivering Defence infrastructure including:

- Project Manager/Contract Administrator (PMCA)
- Design Consultant
- Construction Contractor.

The roles and responsibilities for these Service Providers and Defence stakeholders, including: CFI, DEEERMS and Defence Support Operations (DSO) are explained in Appendix A.

2.2 Structure

Smart Infrastructure outlines requirements for the design and construction of new Defence infrastructure as well as the design and refurbishment of existing Defence infrastructure (including alteration of or addition to). The policy targets ESD and WOL opportunities at the individual facility/building level and a holistic site wide level. The design requirements are divided into the following two categories.

2.2.1 Requirements for All Infrastructure

The requirements under this heading apply to the design of all infrastructure. Smart Infrastructure defines infrastructure as buildings, facilities, their associated infrastructure which may service these facilities, including below and above ground assets, and landscaping.
2.2.2 Requirements for Specific Facility Groups

In addition to the requirements for ‘All Infrastructure’ Smart Infrastructure has requirements specific to Facility Groups. The Facility Groups are the same categories Defence uses to report under the Australian Government’s EEGO Policy requirements. Each sub-meter installed as part of Defence’s National Sub-meter Program (NSP) is characterised according to these categories. The corresponding Facility Types under each Facility Group are included in Appendix B and further guidance is provided in the Checklist.

2.3 ESD and WOL Plan

**Objective 2 – Facilitate the consistent assessment and implementation of design options on an ESD and WOL basis.**

Defence requires the consistent assessment of design options on a WOL basis to demonstrate that the preferred option will maximise Defence’s return on investment over the asset’s useful life.

The Service Provider’s ESD and WOL Plan shall outline the ESD and WOL approach that will be applied during design and/or project delivery, including addressing these Smart Infrastructure requirements, as required under the relevant Contract. Smart Infrastructure requires a WOL assessment for the clauses covering renewable and alternative energy and water opportunities (refer to Sections 4.1.5 and 5.1.5).

Assessment need only be undertaken for options that have been determined to be technically viable. This means that the option has met at a minimum:

- performance criteria and functionality required and
- occupational and environmental health, safety and security needs of facility users.

Options that were considered but not found to be viable shall be documented and justified.

For technically viable options, the WOL assessment shall include both net present value (NPV), and simple payback analysis to assess how the option compares to the base case. Guidance on defining the base case, and calculating NPV and simple payback period, is included in Appendix C.

The design documentation shall clearly state and justify all assumptions applied in the WOL assessment such that it can be verified by Defence, including figures used for the following:

- assessment period
- asset life
- discount rate
- capital cost
- replacement cost
- operating cost
- escalation rates in utility prices (e.g. electricity, gas, and water)
- other escalation rates (e.g. maintenance, labour and capital components)
- maintenance cost
- disposal cost.

Appendix C contains ‘default’ figures to be applied in the WOL assessment, should project or jurisdiction specific data be unavailable. The WOL assessment shall include sensitivity analysis to test the parameters used in the assessment. At this stage the outcomes of the WOL assessment are not intended to influence the Net Personnel & Operating Costs (NPOC) calculation.

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3 Defence’s NSP was established in response to the Australian Government’s EEGO Policy requirement that Defence sub-meters 80% of its electricity consumption.
2.4 Reporting

Objective 3 – Detail the reporting requirements to monitor the application of ESD and WOL requirements during a project.

The key reporting requirement of Smart Infrastructure is the Checklist (available from DEQMS). The same electronic Checklist is to be used throughout the design, and progressively updated and submitted to Defence at each design review stage. The Checklist is to be annexed to relevant design documentation (e.g. ESD Report). A final Checklist shall be provided to Defence at Design Completion.

The Checklist shall be used by the Design Consultant and Defence to:

- demonstrate the meeting or exceeding of Defence’s Smart Infrastructure requirements progressively over the project
- capture the progressive application of other ESD initiatives and strategies identified and implemented during design and
- reference where in the design documentation the requirement has been addressed or justification for why the requirement could not be met.

The submission of the Checklist shall be in an electronic spreadsheet file format.

2.5 Monitoring

Objective 4 – Establish the metrics and measurement systems required to support resource performance monitoring over the infrastructure’s WOL.

Smart Infrastructure requires that an energy and water Metering Strategy (refer 4.1.4.1 and 5.1.4.1) be provided. The Metering Strategy shall be informed by the Energy Performance

Summary Report (refer to BEPM) and Water Performance Summary Report (Section 5.1.3) and meet the following requirements:

- Outline the meters provided to meet BCA and Defence requirements.
- Reference drawings (or agreed equivalent) that reflect layout and parent-child relationships between meters.
- Report predicted resource intensity performance targets for each separate facility/building, or at a more granular level as deemed appropriate by the Design Consultant to effectively monitor performance.
- Submit using the metering template provided in the Checklist.

A final Metering Strategy shall be submitted at Design Completion and verified at Construction Completion.

The Metering Strategy will be used to compare the resource intensity performance targets predicted during design against performance at commissioning and during operation (Figure 1). The Strategy shall be used to inform the following stages:

- At commissioning and handover, including in relevant documentation.
- During the Defects Liability Period (DLP).
- Post Occupancy Evaluation (POE), undertaken in accordance with the relevant Contract.

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4 Defence Project Officer or the Contract Administrator, as applicable.
5 The Metering Strategy does not require a resource intensity performance target for every meter installed. The intent is to report performance at the facility/building level, rather than at sub-building level which should be monitored using a Building Management System (BMS). Regardless of which resource intensity targets are included, the design shall have a corresponding meter for each target that allows the ongoing performance measurement against that target.
The sub-meters installed as part of Defence’s National Sub-meter Program are connected remotely to the Resource Data Management System. This system allows Defence to undertake energy and water data analysis at a facility, site, regional, and national level. The Metering Strategy will be used to inform Defence’s Resource Data Management System and Garrison Estate Management System (GEMS).

The utilisation of this sub-meter data allows Defence to:

1. engage with those responsible for managing facilities to ensure they are operating as per their designed intent
2. utilise actual performance data from Defence specific infrastructure to inform the planning and resource intensity performance targets for future Defence projects (refer Figure 1) and
3. develop and incorporate resource intensity performance benchmarks specific to different Facility Groups into future revisions of Smart Infrastructure.

Further information on Defence’s National Sub-meter Program and the Resource Data Management System can be sourced from DEQMS.

2.6 Building Corporate Knowledge

Objective 5 – Utilise ESD and WOL project reporting to build corporate knowledge and enable Defence to:

a) drive future policy development
b) communicate implemented ESD and WOL initiatives
c) direct resources to support projects which have higher ESD and WOL opportunity.

Smart Infrastructure allows Defence to continue to build its corporate knowledge including:

• application of the Smart Infrastructure requirements and innovative ESD and WOL initiatives that maximise Defence appropriate, site specific opportunities
• resource demand of projects delivered through Defence’s MCF Program and
• predicted resource performance targets for specific Defence facilities.

This corporate knowledge allows Defence on an ongoing basis to:

• monitor and compare the operational performance of facilities against design targets, using Defence’s Resource Data Management System
• revise and further enhance ESD and WOL policy through collaboration with stakeholders
• communicate lessons learnt and opportunities to internal and external Defence stakeholders and
• develop strategies and target Defence resources to maximise ESD and WOL opportunities for infrastructure projects.

2.7 Certification

Design certification for the ESD and WOL aspects of the design, including the requirements of Smart Infrastructure, is included as part of the overarching design certification in accordance with the Contract.

2.8 Health and Safety

Design in accordance with requirements in Smart Infrastructure shall not lower the occupational and environmental health and safety of facility users. This includes consideration of unintended adverse consequences that may arise from implementing a Smart Infrastructure requirement. Where required, Safety in Design and Risk Assessment completed by the Design Consultant shall include the assessment of potential risk of occupational & environmental health impacts resulting from ESD and WOL related design measures.
2.9 ESD Rating Tools and Industry Benchmarks

Smart Infrastructure does not require facilities to achieve a certain Green Star or equivalent rating, whether for design or during operation (e.g. National Australian Built Environment Rating System (NABERS)), other than for office spaces (refer to 4.1.1.2). However, many ESD rating tools and benchmarks have become standard practice. Defence expects the application of these initiatives and strategies, where practical and appropriate. These initiatives shall be recorded in the Checklist.

3. PROJECT

3.1 Adapting to a Changing Climate

3.1.1.1 The Design Consultant shall verify with Defence6 whether the project is located at one of the sites for which adaptation strategies have been recommended in the study titled Adaptation and Planning Strategies to Mitigate the Impact of Climate Change Induced Sea Level Rise, Flooding and Erosion at Selected Defence Sites. This document is available on the DEQMS intranet. The design report shall address the recommended adaptation strategies for the specific site.

4. ENERGY

4.1 Design Requirements for All Infrastructure

4.1.1 Building Energy Performance

4.1.1.1 All office spaces (including those within non-office buildings) shall endeavour to achieve the following energy intensity performance targets:

- Office – Central Services – ≤400 MJ/m²/annum.
- Operational equipment load general power intensity average (computers and other equipment) target of no more than 9 W/m² or equivalent.

4.1.1.2 All office spaces (including those within non-office buildings) with a Net Lettable Area (NLA) ≥2,000 m² must achieve or better the following minimum energy performance standards in accordance with the Australian Government’s EEGO Policy:

- 100% NLA is Defence office accommodation – whole building minimum ≥4.5 stars NABERS (formerly AGBR) or equivalent.
- 50-99% NLA is Defence office accommodation – base building minimum ≥4.5 stars NABERS or equivalent and tenancy ≥4.5 stars NABERS or equivalent.
- 0-49% NLA is Defence office accommodation – tenancy ≥4.5 stars NABERS or equivalent.
- Operational equipment load general power intensity average (computers and other equipment) target of no more than 9 W/m² or equivalent.

Where office space within a building is <2,000 m², the design shall endeavour to achieve 4.5 stars NABERS in accordance with BEPM. Performance based requirements specific to Facility Groups and Types other than offices will be included in future revisions.

Building energy consumption and reporting requirements are outlined in BEPM.

4.1.2 Appliances and Equipment

4.1.2.1 Where domestic appliances and equipment are specified in the design they must achieve or better the following minimum energy label Australian Appliance Star Ratings7:

- Refrigerators 2.5 stars
- Freezers 2.5 stars
- Clothes Washing Machines 3.5 stars
- Clothes Dryers 2 stars
- Dishwashers 3.5 stars
- Televisions 4 stars (Tier 2).

4.1.2.2 Where commercial dryers are required, the design shall compare gas fired dryers against electric units in a WOL assessment based on the specific site criteria outlined in Section 2.3.

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6 Defence Project Officer or the Contract Administrator, as applicable.
7 Sourced from: www.energyrating.gov.au
4.1.2.3 Relevant Information and Communications Technology (ICT) equipment shall meet the current US Environment Protection Authority (EPA) ENERGY STAR® standard, with power management enabled at the time of supply. Project requirements shall be confirmed with the Chief Information Officer Group (CIOG).

Minimum energy (and water) efficiency standards for mechanical equipment are specified in BEPM.

4.1.3 Energy Metering

Sub-metering in new infrastructure or major refurbishment projects shall be in accordance with BCA Section J Energy Efficiency and BEPM.

4.1.3.1 If a Defence Regional Utilities Management System (RUMS) is in operation on the base, then the BMS/meters shall be connected to RUMS. Additionally, new infrastructure or major refurbishment projects shall meet 4.1.3.2.

4.1.3.2 Building and/or precinct level sub-metering shall meet the requirements of Defence’s NSP. These requirements are outlined in the sub-metering documentation contained on the Smart Infrastructure site accessible through DEQMS.

4.1.4 Energy Metering Strategy

4.1.4.1 The design shall include an energy metering strategy that includes each electricity and gas meter to be installed and reports the predicted energy intensity performance target for each separate facility/building (and at a sub-building level, as deemed appropriate). The Metering Strategy shall use the template provided in the Checklist and include gas metering and metering of ‘other fuel and energy systems’. Single line diagrams (or agreed equivalent) reflecting layout and parent-child relationships between meters shall be provided and referenced in the Metering Strategy.

Requirements for gas metering and metering of ‘other fuel and energy systems’ are covered in BEPM.

4.1.5 Renewable and Alternative Energy Opportunities

4.1.5.1 The design shall assess on a WOL basis and report on the potential for mainstream alternative and renewable energy sources to supplement supply in accordance with the requirements in Section 2.3. Where an option utilising renewable or alternative energy sources meets design performance requirements, has the best performing net present value (or net present cost), and achieves a simple payback of less than seven years, compared to the base case, then this option shall be implemented. All assumptions shall be clearly outlined and justified in the design documentation, and submitted through the design review process.

The WOL assessment (as per 4.1.5.1) shall include viable options that utilise renewable and alternative energy for the following:

4.1.5.2 Domestic hot water for new or refurbished infrastructure. At a minimum, where viable the WOL assessment shall include the following heating systems for suitability with solar boost integration:

- instantaneous gas
- gas storage
- heat pump
- electric storage.

4.1.5.3 New or existing traditional fuel generators (e.g. diesel) in remote areas that supply power and/or a back-up power supply. Options should consider hybrid power generation systems that supplement power supply.

4.1.5.4 Facilities containing heated swimming pools. Where renewable energy sources have been utilised in the design then these opportunities shall be reported in the Checklist.

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8 The Metering Strategy does not require an energy intensity performance target for every electricity or gas meter installed. The intent is to provide a corresponding energy intensity performance target for meters that cover a whole building/facility (and at a more granular level if deemed necessary by the Design Consultant to appropriately manage energy consumption during operation). Regardless of which resource intensity targets are included, the design shall have a corresponding meter for each target that allows the ongoing performance measurement against that target.
4.1.6 Passive Design

4.1.6.1 The design shall report on resource efficient passive design features considered and implemented, including but not limited to effective and appropriate landscaping, building orientation, thermal mass, insulation, shading (including from trees) and regulated solar gain as appropriate to the local climatic conditions, the needs of the building and Defence users. Relevant elements of passive design should be investigated as early as possible in the design phase.

4.1.7 Lighting

The design of internal and external artificial lighting in Defence facilities shall be in accordance with the requirements of the Manual of Infrastructure Engineering Electrical (MIEE).

4.1.8 Heating, Cooling and Ventilation

To determine the most appropriate type of system to use for a specific application, the selection, design, installation and operation of Heating, Ventilation and Air Conditioning (HVAC) Systems across Defence shall meet or better the minimum energy efficiency provisions described in the applicable sections of the BCA including, Section J Energy Efficiency, and Defence’s HVAC requirements accessible through DEQMS.

4.1.9 Building Sealing, Insulation and Glazing

Building sealing, insulation and glazing shall meet or better BCA Section J Energy Efficiency requirements.

4.2 Specific Requirements by Facility Groups

In addition to the requirements listed in Section 4.1, the requirements listed below shall also be addressed. Appendix B contains the definitions of Facility Groups. Some Facility Groups have been left intentionally blank to allow for the future inclusion of facility specific requirements.

4.2.1 Accommodation

4.2.1.1 Timer controls shall be considered for all clothes dryers/heaters. External or interior clothes lines shall be provided, where appropriate, to reduce the use of clothes dryers.

4.2.2 Administration/Office

4.2.2.1 Separate digital energy metering for tenanted areas, central services and computer (data) centres shall be provided for office space with floor areas ≥2,000m². Separate digital metering for smaller office areas (<2,000 m²) shall be included where these areas are endeavouring to meet NABERS requirements outlined in 4.1.1.2.

4.2.2.2 An energy management plan shall be developed specifically for buildings with an office floor area ≥2,000m².

Defence technical requirements and energy performance requirements specific to Data Centres are covered in BEPM.

4.2.3 Education and Training

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4.2.4 Health

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4.2.5 Laboratories

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4.2.6 Mess

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4.2.7 Recreation

4.2.7.1 Covers shall be installed for recreational facilities containing heated swimming pools to retain heat when not in use. With input from facility operators and Defence stakeholders, the design shall ensure the covers can be easily deployed and meet operational constraints (e.g. an automated system that can be deployed by a single operator). Cover systems provided for outdoor pools shall consider measures to prevent fouling by birdlife.
4.2.8 Warehouse and Storage

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4.2.9 Workshops and Hangars

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5. WATER

5.1 Design Requirements for All Infrastructure

5.1.1 Appliances and Equipment

5.1.1.1 Where domestic appliances and fixtures are specified in the design they shall achieve or better the following minimum Water Efficiency Labelling Scheme (WELS) ratings9:

- Toilets 4 stars
- Urinals 5 stars
- Taps 5 stars
- Showers 3 stars
- Dishwashers 4 stars
- Clothes Washing Machines 4 stars.

5.1.1.2 Where commercial washing machines are required, the design shall consider front loading washing machines.

5.1.2 Water Metering

5.1.2.1 The provision for water ‘smart meters’ for all water sources supplying new or refurbished building/infrastructure (e.g. potable and recycled water) shall be implemented in accordance with BEPM ‘Hydraulic Metering’ so that total water consumption of each building/infrastructure can be reported. Refer to DEEERMS for further details.

5.1.2.2 In addition to 5.1.2.1, in new or refurbished buildings the provision of water meters at the sub-building level shall be implemented in accordance with the categories in BEPM ‘Hydraulic Metering’ to identify individual water users. Refer to DEEERMS for further details.

5.1.2.3 Water meters in 5.1.2.1 and 5.1.2.2 shall be linked to a control and monitoring system such as an existing or new BMS, a Defence RUMS or other water monitoring system specific to the site/region. The metering solution shall have the capability to connect to Defence’s Resource Data Management System. These specific requirements are outlined in the sub-metering documentation contained on the Smart Infrastructure site accessible through DEQMS.

5.1.3 Water Performance Summary Report

5.1.3.1 The annual water consumption for the project infrastructure shall be estimated using standard industry rates and reported using the template in Appendix D. The Water Performance Summary Report shall include a breakdown of the total annual water uses, including but not limited to: occupant amenities, HVAC (e.g. cooling towers), washdown or process, and irrigation. All design assumptions, including but not limited to consumption rates, equipment flow rates, and usage patterns, used to calculate the predicted water consumption shall be stated in the design documentation.

5.1.4 Water Metering Strategy

5.1.4.1 The design shall include a water metering strategy that includes each water meter to be installed and using the Water Performance Summary Report, the predicted water intensity performance target for each facility/building (and at a sub-building level, as deemed appropriate10). The Metering Strategy shall use the template provided in the Checklist. Drawings (or agreed equivalent) showing layout and parent-child relationships between meters shall be provided and referenced in the Metering Strategy.

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9 Sourced from: www.waterrating.gov.au
10 The Metering Strategy does not require a water intensity performance target for every water meter installed. The intent is to provide a corresponding water intensity performance target when a water meter is to be installed at the facility/building level (and at a more granular level if deemed necessary by the Design Consultant to appropriately manage water consumption during operation). Regardless of which resource intensity targets are included, the design shall have a corresponding meter for each target that allows the ongoing performance measurement against that target.
5.1.5 Alternative Water Opportunities

5.1.5.1 The design of all new and refurbished facilities shall assess on a WOL basis and report, in accordance with Section 2.3, the potential to use non-potable water sources such as rainwater and fit-for-purpose recycled water for uses including but not limited to sanitary flushing, laundry water, cooling water, aircraft, vehicle and equipment washing and irrigation. Where an option utilising alternative water sources meets design performance requirements, has the best performing net present value (or net present cost), and achieves a simple payback of less than seven years, compared to the base case, then this option shall be implemented. All assumptions shall be clearly outlined and justified in the design documentation, and submitted through the design review process.

The WOL assessment (as per 5.1.5.1) shall include the assessment of viable alternative water opportunities for the following:

5.1.5.2 Options for irrigation water to be provided by fit-for-purpose non-potable water sources (excluding short-term establishment irrigation). Groundwater supply shall be only used subject to approval from the relevant Defence authority responsible for the management of groundwater bores on site.

5.1.5.3 Options to reuse or recycle wash-down water where the facility will use potable water.

Where alternative water sources have been utilised in the design these opportunities shall be summarised in the Checklist.

5.1.6 Water Sensitive Urban Design

5.1.6.1 Water Sensitive Urban Design (WSUD) objectives in Engineers Australia’s Australian Runoff Quality – A guide to Water Sensitive Urban Design (Chapter 1), shall be considered in the design, including:

- incorporating opportunities in reducing potable water demand assessed in 5.1.5
- minimising wastewater generation and maximising the treatment of wastewater suitable for effluent reuse and/or release to receiving waters
- treating urban stormwater to meet water quality objectives for reuse and/or discharge to receiving waters and

- preserving the natural hydrological regime of catchments (refer to 8.1.1.3).

Relevant elements of WSUD that have overall site layout implications should be investigated as early as possible in the design phase.

5.1.7 Landscaping

5.1.7.1 Preference shall be given to native, regionally appropriate, drought tolerant plants with low ongoing watering requirements, while reflecting the best plants for the purpose.

5.1.7.2 The landscape design shall detail the proposed planting schedule, plant species, and irrigation scheme. The design shall demonstrate that relevant information documents such as existing base and regional Landscape Management Plans (or equivalent) have been considered.

6. WASTE

All facility and infrastructure designs shall aim to promote recycling, reuse and reduced disposal of waste-to-landfill in the construction, operation and decommissioning stages of the infrastructure lifecycle.

6.1 Design Requirements for All Infrastructure

6.1.1 Waste Management

6.1.1.1 The design shall address the facility’s operational waste management requirements outlined in Appendix E.

6.1.1.2 Where recycling exists on a base the design shall provide for the separation and storage of general waste and recyclable streams for the facility. It shall be documented in the case where recycling is not currently available at the base.

6.1.1.3 The design shall identify the hazardous waste streams to be generated and provide appropriate storage areas, waste receptacles and collection points for the management of this waste in accordance with Commonwealth and State/Territory regulations.

6.1.1.4 If applicable, the design shall provide for adequate and appropriate receptacles and storage areas for batteries and tyres to be recycled and disposed of in accordance with State/Territory regulations and licensed arrangements.
6.1.1.5 If applicable, the design shall provide for adequate and appropriate receptacles and storage areas to enable the separation and recycling of ferrous metals and non-ferrous metals.

6.1.1.6 If applicable, the design shall provide for adequate and appropriate receptacles and storage areas to enable the appropriate collection, separation and disposal of petroleum, oils and lubricants including but not limited to liquid waste, containers and used rags.

6.1.2 Construction Waste Recycling Target

6.1.2.1 The project shall achieve a minimum 70% of all construction waste by weight that will be either reused or recycled (diverted from landfill) on site or at licensed facilities, as stipulated under respective State or Territory regulations, during demolition and construction works. The 70% target excludes any hazardous waste and/or soil containing contamination including but not limited to in-ground asbestos and hydrocarbons, and shall exclude any clean cut and fill soil.

6.2 Specific Requirements by Facility Groups

In addition to the requirements listed in Section 6.1, the requirements listed below shall be addressed. Appendix B contains definitions of the Facility Groups. Some Facility Groups have been left intentionally blank to allow for the future inclusion of facility specific requirements.

6.2.1 Accommodation

6.2.1.1 Subject to 6.1.1.2, common use areas (e.g. recreation rooms) shall have receptacles provided for the separation and disposal of general waste and recyclables.

6.2.1.2 Subject to 6.1.1.2, a dedicated storage area shall be provided to allow the segregation and collection of co-mingled (or other recyclable waste stream) and general waste at each unit block or house.

6.2.2 Administration

6.2.2.1 Subject to 6.1.1.2, all administration facilities shall have recycling facilities provided for cardboard, packaging and office paper to allow separation from general waste and other recyclables.

6.2.3 Education and Training

This clause is intentionally blank

6.2.4 Health

This clause is intentionally blank

6.2.5 Laboratories

This clause is intentionally blank

6.2.6 Mess

6.2.6.1 Where there is existing diversion of organic waste on the site, the design shall provide for the separation of organic waste from messes. The provision for the separation of organic waste from other mess waste shall be documented in the design (refer 6.1.1.1) and shall consider options to treat and dispose the waste, other than to landfill. It shall be documented in the case where diversion of organic waste from landfill does not occur on site.

6.2.7 Recreation

This clause is intentionally blank

6.2.8 Warehouses and Storage

6.2.8.1 Subject to 6.1.1.2, the design shall provide for adequate and appropriate receptacles to enable the separation and recycling of cardboard and paper from other recyclables.

6.2.9 Workshops and Hangars

6.2.9.1 Subject to 6.1.1.2, the design shall provide for adequate and appropriate receptacles to enable the separation and recycling of cardboard and paper from other recyclables.

7. MATERIALS & SMART PROCUREMENT

All facility and infrastructure designs shall aim to reduce the consumption, and maximise the reuse and recycling of materials. Materials shall be fit for purpose, have a cradle-to-grave low pollutant output, require low energy input in their fabrication, and have considered the energy required for their transportation to the project site.
7.1 Design Requirements for All Infrastructure

7.1.1.1 The design shall consider opportunities to reuse materials and equipment.

7.1.1.2 The design shall consider end-of-life such that resources associated with demolition and wastes produced during refurbishment/demolition are minimised. This could include but not be limited to the design of structural framing, roofing and façade cladding systems for disassembly and/or the design of the building’s structural, services and spatial layout such that it can be adapted for future uses to minimise obsolescence.

The following material requirements are specified in the design specifications and associated design documentation as appropriate:

7.1.1.3 Where Polyvinyl Chloride (PVC) is being considered for flooring, ‘Best Practice PVC’ or suitably cost-effective and environmentally sensitive non-PVC alternatives shall be used in accordance with Defence’s Polyvinyl Chloride Policy (refer to DEQMS).

7.1.1.4 All refrigerants used shall have an Ozone Depleting Potential (ODP) of zero.

7.1.1.5 All insulation used in building fabric and services shall have an ODP of zero.

7.1.1.6 Maximise (at least 95% of total cost) the use of timber sourced either from post-consumer reused timber or from Forest Certification Schemes accredited by the Forest Stewardship Council (FSC) International or Programme for the Endorsement of Forest Certification (PEFC). Only Forest Certification schemes that have been deemed to satisfy requirements of the Green Building Council of Australia’s (GBCA) ‘Essential’ criteria for forest certification shall be considered. Preserved timber shall use low-toxicity preservatives.

7.1.1.7 Minimise the use of Volatile Organic Compounds (VOCs) in materials such as internal paints, sealants and adhesives. At a minimum, surface coatings shall be in accordance with Australia Paint Approval Scheme (APAS) VOC Limits.

7.1.1.8 Materials or products containing hexabromocyclododecane (HBCD) shall be avoided, unless there is no viable alternative product available.

7.1.1.9 Timber treated with Copper Chromium Arsenic (CCA) should be avoided and alternatives to treated timber sought in accordance with Defence’s Policy for CCA Treated Timber (refer to DEQMS).

8. POLLUTION PREVENTION

All facility and infrastructure designs shall integrate pollution prevention measures to minimise emissions and discharges of pollutants during their operation ensuring that they comply with all relevant Commonwealth, State/Territory and Local Government regulations.

8.1 Design Requirements for All Infrastructure

8.1.1.1 Where relevant, Defence pollution prevention policies and guidelines (sourced from DEQMS) shall be considered and referenced in the design. This includes, but is not limited to, the potential for pollution from the following:

- stormwater
- wastewater
- open burning and incineration
- Aqueous Film Forming Foam (AFFF)
- small arms and weapons ranges
- fuel facilities, infrastructure and equipment
- maintenance and repair facilities
- chemical storage
- liquid and solid waste storage.

8.1.1.2 Trade waste systems shall be designed, constructed and operated in accordance with relevant State/Territory regulations.

8.1.1.3 The design shall consider WSUD and landscaping measures to ensure that the development does not increase peak stormwater flows for rainfall events and increase the concentration of pollutants in stormwater runoff. Relevant elements of WSUD that have overall site layout implications should be investigated as early as possible in the design phase.

11 ‘Best Practice PVC’ refers to certified products that meet the Green Building Council of Australia’s Best Practice Guidelines for PVC in the Built Environment

12 Australia Paint Approval Scheme (APAS) VOC Limits available from APAS document D181: www.apas.gov.au
9. CONSTRUCTION

9.1 Construction Requirements

9.1.1 Where an environmental management plan or equivalent is required under the relevant Contract, it should also address the Smart Infrastructure requirements in Appendix F. The environmental management plan should outline management actions to address the following requirements (9.1.1.2 to 9.1.1.11) during construction:

9.1.1.2 During demolition and construction works the project shall achieve a minimum 70% of all construction waste by weight diverted from landfill in accordance with requirement 6.1.2.1.

9.1.1.3 Prior to commencement of construction, an assessment of alternative construction waste minimisation strategies shall be undertaken, and implemented as appropriate. These alternatives could include but not be limited to initiatives such as supplier take-back of packaging and off-cuts, pre-manufacturing or on-site waste grinding to produce construction materials (e.g. grinding of bricks/concrete/wood to make aggregate and woodchips).

9.1.1.4 Construction waste associated with the development of the facility shall be classified in accordance with State or Territory regulations.

9.1.1.5 All contaminated land and hazardous material shall be managed in accordance with applicable regulations and site based management plans.

9.1.1.6 No construction waste shall be disposed of on Defence sites, excluding waste that has been reused/recycled for beneficial use onsite. Subject to 9.1.1.5, all construction waste shall be taken off site and appropriately disposed of in accordance with all relevant State/Territory regulations during or at the completion of construction.

9.1.1.7 All topsoil affected by the construction works shall be separated and protected from degradation, erosion or mixing with fill, contamination or waste.

9.1.1.8 Site-specific Erosion and Sediment Control Plans (ESCPs) shall be implemented. ESCP shall include methods of preventing the loss of materials during construction by stormwater runoff and/or wind erosion, preventing sedimentation of particulates in surface water, sewers or watercourses, preventing air pollution with dust and particulate matter and preventing spills of substances such as fuel and paint which can result in soil contamination.

9.1.1.9 All PVC products shall be recycled and/or reused when being disposed. However, when demonstrated that there are no recycling options available, PVC products shall be disposed of at a licensed landfill facility.

9.1.1.10 No burning or incineration of construction waste shall occur on site, including timber products and/or felled/cleared timber.

9.1.1.11 Reporting and response to environmental incidents shall be in accordance with Defence policy and systems.

9.2 Reporting Requirements

9.2.1.1 The Construction Contractor shall submit a report to Defence\textsuperscript{13} at Construction Completion comparing the percentage of construction waste recycled or reused to the pre-construction target. This can be a section in the final monthly (or similar) report submitted by the Construction Contractor.

9.2.1.2 Where a Metering Strategy has been developed during design, the Construction Contractor shall provide Defence\textsuperscript{14} at Construction Completion an updated Metering Strategy that compares and reports the predicted design resource intensity performance targets against actual performance (to the extent of available data at commissioning) for each energy and water meter/sub-meter installed\textsuperscript{15}. The submission shall include drawings (or agreed equivalent) showing the layout and parent-child relationships between meters referenced in the Metering Strategy.

\textsuperscript{13} Defence Project Officer or Contract Administrator, as applicable.

\textsuperscript{14} Defence Project Officer or Contract Administrator, as applicable.

\textsuperscript{15} Noting that full occupancy and operation of the facility may not occur at commissioning, the intent is to report on the implementation of the Metering Strategy and track any changes since Design Completion.
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>AFFF</td>
<td>Aqueous Film Forming Foam</td>
</tr>
<tr>
<td>AGBR</td>
<td>Australian Greenhouse Building Rating</td>
</tr>
<tr>
<td>Alternative Water</td>
<td>Water that is not main-supplied potable water</td>
</tr>
<tr>
<td>ASEE</td>
<td>Assistant Secretary Environment and Engineering Branch</td>
</tr>
<tr>
<td>BCA</td>
<td>Building Code of Australia</td>
</tr>
<tr>
<td>BEPM</td>
<td>Defence Building Energy Performance Manual</td>
</tr>
<tr>
<td>BMS</td>
<td>Building Management System</td>
</tr>
<tr>
<td>CCA</td>
<td>Copper Chromium Arsenic</td>
</tr>
<tr>
<td>CDR</td>
<td>Concept Design Report submitted at the 30% design stage</td>
</tr>
<tr>
<td>CFI</td>
<td>Capital Facilities and Infrastructure Branch</td>
</tr>
<tr>
<td>Commonwealth</td>
<td>Commonwealth of Australia</td>
</tr>
<tr>
<td>Construction Completion</td>
<td>Achievement of “Completion” of the construction works under the relevant Contract</td>
</tr>
<tr>
<td>Construction Contractor</td>
<td>Responsible for construction under the relevant Contract</td>
</tr>
<tr>
<td>Contract</td>
<td>Unless specified the relevant Contract that the Service Provider has been engaged under (for the purpose of Smart Infrastructure this is primarily the PMCA, Design Consultant and/or Construction Contractor) from the Department of Defence Infrastructure Division’s suite of contracts for the design and construction of Defence infrastructure</td>
</tr>
<tr>
<td>DDR</td>
<td>Detailed Design Report submitted at the 90% design stage</td>
</tr>
<tr>
<td>DEEERMS</td>
<td>Directorate of Energy Efficiency Environmental Resource Management and Sustainability</td>
</tr>
<tr>
<td>Defence</td>
<td>Australian Department of Defence</td>
</tr>
<tr>
<td>DEQMS</td>
<td>Defence Estate Quality Management System</td>
</tr>
<tr>
<td>Design Brief</td>
<td>Technical document(s) setting out the Defence requirements for the design of the relevant infrastructure under the relevant Contract</td>
</tr>
<tr>
<td>Design Completion</td>
<td>Completion of final pre-construction design documentation under the relevant Contract</td>
</tr>
<tr>
<td><strong>Glossary</strong></td>
<td></td>
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<tr>
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</tbody>
</table>

<p>| <strong>Design Consultant</strong> | Consultant responsible for design under the relevant Contract |
| <strong>Design Report or Design Documentation</strong> | Documentation submitted to a Defence Project Officer or their Contract Administrator, where applicable, at a specific design milestone in accordance with the relevant Contract |
| <strong>DGBR</strong> | Defence Green Building Requirements |
| <strong>DLP</strong> | Defects Liability Period |
| <strong>DSO</strong> | Defence Support Operations |
| <strong>DSRG</strong> | Defence Support and Reform Group |
| <strong>EAP</strong> | Environmental Assessment Report |
| <strong>ECC</strong> | Environmental Clearance Certificate |
| <strong>EE Branch</strong> | Environment and Engineering Branch |
| <strong>EEGO Policy</strong> | Energy Efficiency in Government Operations Policy |
| <strong>EMOS</strong> | Estate Maintenance and Operations Services |
| <strong>EMP</strong> | Environmental Management Plan |
| <strong>Energy Star</strong> | Created by the US Environmental Protection Agency in 1992 |
| <strong>EPA</strong> | Environment Protection Authority |
| <strong>EPBC Act</strong> | Environment Protection and Biodiversity Conservation Act 1999 |
| <strong>ERIM</strong> | Estate Register Information Model |
| <strong>ESCP</strong> | Erosion and Sediment Control Plan |
| <strong>ESD</strong> | Ecologically Sustainable Development |
| <strong>Fit-for-purpose non-potable water</strong> | Water that is treated to an appropriate quality level for its intended end use(s), as described in relevant regulations |
| <strong>FDR</strong> | Final Design Report design documentation (notionally 100%) for construction |
| <strong>GBCA</strong> | Green Building Council of Australia |
| <strong>Green Star</strong> | Comprehensive, national, voluntary environmental rating system that evaluates the environmental design and construction of buildings and communities managed by the Green Building Council of Australia |</p>
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HBCD</td>
<td>Hexabromocyclododecane (brominated fuel retardant)</td>
</tr>
<tr>
<td>HVAC</td>
<td>Heating Ventilation and Air Conditioning</td>
</tr>
<tr>
<td>IER</td>
<td>Initial Environmental Review</td>
</tr>
<tr>
<td>ICT</td>
<td>Information and Communications Technology</td>
</tr>
<tr>
<td>MCF</td>
<td>Major Capital Facilities</td>
</tr>
<tr>
<td>MPFR</td>
<td>Master Plan and Feasibility Report submitted at the 5% design stage</td>
</tr>
<tr>
<td>MIEE</td>
<td>Manual of Infrastructure Engineering – Electrical</td>
</tr>
<tr>
<td>NABERS</td>
<td>National Australian Built Environment Rating Scheme</td>
</tr>
<tr>
<td>NCC</td>
<td>National Construction Code</td>
</tr>
<tr>
<td>NLA</td>
<td>Net Lettable Area refers to the floor area of space that can be used as offices within the premises and determined in accordance with the Property Council of Australia (PCA) March 1997 Method of Measurement Standard for Rated Area</td>
</tr>
<tr>
<td>Non-Potable Water</td>
<td>Water that is not of drinking water quality, but which may still be used for other purposes, depending on its quality</td>
</tr>
<tr>
<td>NPOC</td>
<td>Net Personnel and Operating Cost</td>
</tr>
<tr>
<td>NPC</td>
<td>Net Present Cost</td>
</tr>
<tr>
<td>NPV</td>
<td>Net Present Value</td>
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<tr>
<td>NSP</td>
<td>National Sub-meter Program</td>
</tr>
<tr>
<td>O&amp;M</td>
<td>Operation and Maintenance</td>
</tr>
<tr>
<td>ODP</td>
<td>Ozone Depleting Potential</td>
</tr>
<tr>
<td>PMCA</td>
<td>Project Manager/Contract Administrator</td>
</tr>
<tr>
<td>POE</td>
<td>Post Occupancy Evaluation</td>
</tr>
<tr>
<td>Potable Water</td>
<td>Water of a quality suitable for drinking, cooking and personal bathing as described in the Australian Drinking Water Guidelines</td>
</tr>
<tr>
<td>Project Officer</td>
<td>CFI Project Officer responsible for the project</td>
</tr>
<tr>
<td>PV</td>
<td>Photovoltaic</td>
</tr>
</tbody>
</table>
## Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
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<tbody>
<tr>
<td>PVC</td>
<td>Polyvinyl Chloride refers to all PVC products including ‘Standard PVC’ and</td>
</tr>
<tr>
<td></td>
<td>‘Best-Practice PVC’</td>
</tr>
<tr>
<td>PVC – Best Practice</td>
<td>‘Best Practice PVC’ refers to certified products that meet the Green Building</td>
</tr>
<tr>
<td></td>
<td>Council of Australia’s Best Practice Guidelines for PVC in the Built</td>
</tr>
<tr>
<td></td>
<td>Environment</td>
</tr>
<tr>
<td>PVC – Non-PVC</td>
<td>All other products that are not defined as PVC</td>
</tr>
<tr>
<td>alternatives</td>
<td></td>
</tr>
<tr>
<td>PVC – Standard PVC</td>
<td>All other products containing PVC, excluding ‘Best Practice PVC’</td>
</tr>
<tr>
<td>Renewable Energy</td>
<td>Energy which can be obtained from natural resources that can be constantly</td>
</tr>
<tr>
<td></td>
<td>replenished e.g. bioenergy, geothermal, ocean, solar, hydropower and wind</td>
</tr>
<tr>
<td></td>
<td>energy</td>
</tr>
<tr>
<td>RUMS</td>
<td>Regional Utility Management System</td>
</tr>
<tr>
<td>SDR</td>
<td>Schematic Design Report submitted at the 50% design stage</td>
</tr>
<tr>
<td>Service Provider</td>
<td>PMCA, Designer or Construction Contractor (as the case may be)</td>
</tr>
<tr>
<td>VOC</td>
<td>Volatile Organic Compounds</td>
</tr>
<tr>
<td>WELS</td>
<td>Water Efficiency Labelling Scheme</td>
</tr>
<tr>
<td>WSUD</td>
<td>Water Sensitive Urban Design</td>
</tr>
<tr>
<td>WOL</td>
<td>Whole-of-Life</td>
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</table>
Appendices
Vehicle wash point capturing and recycling of road water, RAAF Base Amberley, Queensland.
Appendix A -
Roles and Responsibilities

A1 Defence Roles and Responsibilities

The primary roles and responsibilities of Defence in the application of Smart Infrastructure are outlined in this section.

A1.1 Capital Facilities and Infrastructure

The role and responsibility of CFI specific to Smart Infrastructure is to:

- oversee the inclusion of the latest Smart Infrastructure requirements, relevant Defence requirements and specific exclusions associated with Smart Infrastructure at the time of preparing the relevant Contract and Design Brief when engaging Service Providers
- oversee the implementation of Smart Infrastructure by the PMCA, Design Consultant, and Construction Contractor during the development and delivery of Defence infrastructure
- ensure the Checklist is submitted progressively at each relevant design review stage for each project
- ensure DEEERMS receives for each project the:
  - finalised Checklist (including the Metering Strategy) at Design Completion
  - construction waste recycling and reuse percentage achieved compared to the pre-construction target and updated Metering Strategy at Construction Completion.
- continue to engage with DEEERMS during consultation, feedback, and training for the ongoing application of Smart Infrastructure and
- ensure CFI business processes and templates are updated to reflect the requirements of Smart Infrastructure.

A1.2 Directorate of Energy Efficiency, Environmental Resource Management and Sustainability

The role and responsibility of the Directorate specific to Smart Infrastructure is to:

- ensure Smart Infrastructure is integrated into Defence business processes, Defence Contracts and associated documentation, and made available on DEQMS
- work with those developing the Design Brief to ensure applicable clauses are included and direct resources to support projects which have higher ESD and WOL opportunities
- undertake timely and effective reviews of design reports and associated documentation, including the Checklist and WOL option assessments, working with CFI such that opportunities from this input can be maximised through development of the design
- monitor, evaluate and report the implementation of Smart Infrastructure through the submitted Checklist, and undertake regular consultation with Defence internal and external stakeholders and
- continue to build Defence’s ESD and WOL corporate knowledge to:
  - drive future policy development, including updating Smart Infrastructure from time to time
  - communicate implemented ESD and WOL initiatives
  - direct resources to support projects which have higher ESD and WOL opportunity.
A1.3 Defence Support Operations

The role and responsibility of DSO environmental personnel specific to Smart Infrastructure is to:

• provide site specific advice to Design Consultants related to the application of Smart Infrastructure and other opportunities and innovation during design workshops and reviews of design reports, as required and

• check that the environmental management plan requirements specific to Smart Infrastructure have been addressed prior to approving an Environmental Clearance Certificate (ECC).

A2 PMCA Roles and Responsibilities

The role and responsibility of the PMCA specific to Smart Infrastructure is to:

• ensure that the Smart Infrastructure requirements, relevant Defence requirements and specific exclusions associated with Smart Infrastructure have been identified and referenced in the Design Brief using the guidance on DEQMS and that DEEERMS has been engaged, as required, when developing the Design Brief

• facilitate consultation between the Design Consultant, Defence, and other stakeholders, as required

• check that the Design Consultant has reported against Smart Infrastructure by submitting a Checklist at each design review stage in accordance with the Contract

• check that the Design Consultant has submitted a finalised Checklist (including a Metering Strategy) at Design Completion

• document any deviations from the final design, following Design Completion, and report whether the proposed alternative meets the Smart Infrastructure requirements.

• check that the Construction Contractor is adhering to their environmental management plan during construction, including management measures specific to the Smart Infrastructure requirements

• report environmental incidents to Defence in accordance with Defence policy and systems

• check that the Construction Contractor has reported the construction waste recycling and reuse percentage achieved compared to the pre-construction target and updated the Metering Strategy at Construction Completion and

• ensure that a POE is undertaken as stipulated in the relevant Contract, and in accordance with the ESD and WOL Plan.

A3 Design Consultant

A3.1 Role and Responsibility of Design Consultant

The role and responsibility of the Design Consultant specific to Smart Infrastructure is to:

• meet or exceed the Smart Infrastructure minimum requirements, and integrate additional ESD initiatives, strategies and resource intensity performance targets to maximise site specific opportunities, using a WOL approach to ensure that an efficient and effective solution is recommended

• report against the Smart Infrastructure requirements by submitting a Checklist at each design review stage, appended to an ESD Report or similar

• submit a finalised Checklist at Design Completion and

• assess any deviations from the final design, where required during construction, to ensure that any proposed alternative still meets the Smart Infrastructure requirements.

A3.2 Design Consultant Approach

The ESD and WOL Plan shall outline how ESD and WOL initiatives and strategies will be integrated into the design process to ensure that opportunities are captured and maximised including:

• engagement with relevant stakeholders (e.g. building users, Estate Maintenance and Operations Services (EMOS) and waste contractors responsible for operation and maintenance of the facilities, and relevant DSO environmental personnel)
• workshops early in the design phase followed by further investigation and assessment to report back outcomes at subsequent workshops
• input of ESD/efficiency initiatives, waste and pollution prevention design elements into O&M Manuals and procedures, e.g. Building User’s Guide, Energy Management Plans, and Utility Management Plans and
• inclusion of relevant items from Section 9.1, when required to complete an environmental management plan in accordance with the relevant Contract.

A4 Construction Contractor

A4.1 Roles and Responsibilities of Construction Contractor

The role and responsibility of Construction Contractors specific to Smart Infrastructure is to:
• meet, and ensure that subcontractors meet the relevant Smart Infrastructure Construction requirements
• ensure that the project specific environmental management plan addresses the Smart Infrastructure requirements
• ensure that when requesting any deviation from the final design, this alternative still meets the Smart Infrastructure requirements and
• report to Defence the construction waste recycling and reuse percentage achieved compared to the pre-construction target and update the Metering Strategy at Construction Completion.

An ECC and associated environmental management plan specific to the project shall be prepared by the action authority (i.e. the proponent) and submitted for approval to the relevant DSO environmental personnel prior to any work commencing. Further information on this process and the ECC is located on DEQMS.

A4.2 Construction Contractor – Construction Stage Management Requirements

The ESD and WOL Plan shall outline how ESD initiatives and strategies will be implemented during construction to ensure that impacts are minimised and opportunities are captured and maximised including:
• management plans (e.g. environmental management plan), outlining key responsibilities, procedures, frequency and type of reporting to Defence
• monitoring activities and site audits to ensure processes outlined in management plans are adhered to, including those of subcontractors
• use of forms and registers to track and demonstrate implementation and adherence to requirements and initiatives and
• review and update of management plans during construction.
## Facility Group categories

1. Facility Group categories are set and currently new options cannot be added.
2. Facility Type categories are used for internal Defence energy management activities.
3. ERIM is used to classify Defence buildings, infrastructure, infrastructure systems, equipment, equipment systems and spaces, for the general operation and maintenance of the Estate. ERIM groups classified buildings and spaces in accordance with the National Construction Code (NCC) Volume One – Building Code of Australia (BCA).
4. Substations, distribution pillars, facilities or buildings where 80% or more of the electricity consumption or peak design electrical load cannot be assigned to a single Facility Group.
5. All other facilities or infrastructure not covered in the other Facility Groups listed.
Appendix C - Whole-of-Life Assessment

This section further outlines the requirements of the WOL assessment. The WOL assessment allows the quantification of not only the capital cost but the potential ongoing costs or savings associated with each option. The WOL assessment should be undertaken in accordance with the requirements of AS4536:1999 Life Cycle Costing an application guide.

The WOL assessment shall include both net present value (NPV) and simple payback analysis to assess how the option compares to the base case.

Defining the Base Case

The intent of the base case is to represent the design option that utilises a ‘conventional approach’. The base case scenario shall be clearly defined in the WOL assessment, ensuring that the base case meets the following requirements:

- Includes all plant and material, and associated utility connection/consumption (e.g. water and electricity, diesel generator), for both operation and maintenance, required to achieve the performance criteria and functionality required.
- Reflects the associated capital, operating, maintenance and disposal costs of the option such that it fully achieves the performance criteria and functionality required.

When comparing the base case scenario to the options that utilise renewable energy and alternative water sources, the alternative resource options in most cases will still need to be connected to a mains utility supply. In the case of remote sites (e.g. training ranges) an existing diesel generator providing a power supply could be supplemented or replaced by a hybrid power generation system. In either case the WOL assessment shall include the back-up contingencies, and associated capital outlay, required.

Net Present Value

The NPV is the discounted value of the expected benefits of the project, less the discounted value of the expected costs.

For information on how to determine the NPV, including guidance on applying a discount rate, determining the assessment period, and undertaking sensitivity analysis, reference should be made to the Department of Finance and Deregulation’s Handbook of Cost-Benefit Analysis and Introduction to Cost-Benefit Analysis and Alternative Evaluation Methodologies. The determination of the NPV shall include a sensitivity analysis. This is a technique which involves altering the parameters of a project evaluation to see how they affect the outcome.

The WOL assessment shall be based on an estimate of the capital cost, operational costs, maintenance costs and disposal costs as follows:

- Capital costs – the estimated costs associated with the design and development of the facility. These will include the design, planning, consultancy services, seeking approvals, environmental, the purchase price or the construction costs, including associated plant and equipment.
- Replacement costs (where applicable) – the estimated cost of components or plant within the asset that need replacement because they have a shorter life than the assessment period.
- Operating costs – the estimated costs (excluding maintenance) of operating or leasing the capital asset. These costs include utilities, labour, rental costs, interest paid, taxes, contract costs and other overhead costs. When considering operating costs, it is important to include increases over time (i.e. inflation) in all operational costs, including but not limited to utility costs.
- Maintenance costs – the estimated costs incurred in maintaining the capital asset over its useful life. These costs are to include any performance management, consumables, repairs and associated labour costs, major overhauls, replacement, and factor additional costs of maintaining specialised or unique technologies in remote areas.
- Disposal costs – the estimated costs associated with selling and/or safely disposing of the capital asset at the end of its useful life. This may include remediation costs and any due diligence (if required).
The Goods and Services Tax shall be included within all cost elements of the estimate.

The WOL assessment shall include consideration of any broader or site-specific environmental or social factors. All acquisitions, operations and disposal of assets can have direct and indirect environmental impacts and this may attract additional costs and benefits. These are not covered in detail here but should be included as part of an assessment of a specific proposal including any Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) considerations.

When undertaking a WOL assessment, the following shall be considered and assumptions documented:

- assessment period
- base case scenario
- capital cost
- replacement cost
- asset life
- annual operating costs including any sewage/trade waste discharge costs
- other escalation rates (e.g. maintenance, labour and capital components)
- maintenance costs
- disposal costs including salvage value at end of economic life of infrastructure and included plant and equipment.

The following ‘default’ values are to be used in the WOL assessment, should project or jurisdiction specific data be unavailable:

- discount rate – Government Bond Rate
- annual utility escalation rate for electricity – 3.5%
- annual utility escalation rate for gas – 3.5%
- annual utility escalation rate for water – Consumer Price Index
- annual utility escalation rate for diesel – National non-farm Gross Domestic Product
- effective utility rates (electricity, water, gas, and diesel) – use the effective contract rate specific to the site sourced from Defence, or the published rates for sites on a regulated tariff (in the case of smaller sites).

**Simple Payback Period**

The payback period is the time required for the design option to redeem the difference in the initial investment relative to the base case. While the payback period does not take into account the future value of funds, it is used together with NPV to justify design decisions and guide design development as to when Defence considers justifiable an investment into design solutions that utilise renewable or alternative resources.

The simple payback period shall be determined in the context of options compared to the base case scenario. For example, a simple payback calculation for a ‘solar PV installation option’ compared to a ‘no solar PV option’ for a mess facility shall include the difference in capital investment and difference in operational costs between the two options. Both options would require connection to the grid.

The simple payback period analysis for the solar PV installation option shall be calculated as follows:

\[
\text{Simple Payback Period} = \frac{\Delta \text{ Initial Investment} (\$)}{\text{Net Annual Savings} (\$ \text{ per year})}
\]

Where the \( \Delta \) denotes the difference between the initial capital cost of the base case and option being considered.

The net annual savings, compared to the operational and maintenance costs of the base case, shall at a minimum include the following:

- energy savings, for example from reduced electricity, gas or other fuel use
- water savings
- waste disposal/treatment savings, e.g. reduction in sewage disposal and trade waste charges
- maintenance savings
- personnel cost savings.

**Using WOL to Justify Investment**

WOL assessment, utilising both the net present value and payback period together shall be used to help justify capital spending on options that achieve value for money for Defence over the life of the facility.

Where the option has the best performing NPV or NPC, and the payback period analysis results in less than seven years, then this option shall be implemented.

Where the calculated simple payback is greater than the specified threshold then the decision to implement the option, based on the recommendations of the WOL assessment, will be at the discretion of Defence (Project Director).

As stated in Section 2.3 WOL assessment alone cannot justify the preference for a design option.
Appendix D -

Water Performance Summary Report

Project Water Performance Summary

The project shall report the predicted total annual water consumption for the project, broken down by each element of project infrastructure/facility.

Assumptions shall be stated for each demand such that calculations can be verified.

The table below is provided for guidance and can be modified as required to best suit specific project requirements, provided that the above intent is met.

*Table: Predicted project water consumption broken down by facility*

<table>
<thead>
<tr>
<th>Facility Number</th>
<th>Facility Name</th>
<th>Demand</th>
<th>Water Source</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mains water (e.g. rainwater, recycled water etc.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(kL/d)</td>
<td>(kL/year)</td>
<td>(kL/d)</td>
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<td></td>
<td></td>
<td></td>
<td>(kL/year)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>XXXX</td>
<td>Amenities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>HVAC (e.g. cooling towers)</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Wash down or process</td>
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<td></td>
<td></td>
<td>Irrigation</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Other</td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Facility Total Annual Consumption (kL)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>XXXX</td>
<td>Amenities</td>
<td></td>
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<td></td>
<td></td>
<td>HVAC (e.g. cooling towers)</td>
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<td>Other</td>
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<tr>
<td></td>
<td></td>
<td>Facility Total Annual Consumption (kL)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. A different column should be included for each alternative water source, e.g. rainwater, recycled water, stormwater, groundwater, or river water.

Water meters shall be provided as outlined in Section 5.1.2. The water Metering Strategy (refer Section 5.1.4) shall report a water intensity performance target, using the predicted consumption from the Water Performance Summary Report, corresponding to each facility/building level meter to be installed.
Appendix E - Waste Management

Waste Management

At a minimum, the design shall identify and address the following waste management requirements:

- Input from key stakeholders including, as a minimum, the waste contractor, DSO environmental personnel, the proposed facility users and relevant base operators.

- Strategies in the facility designs that help reduce the volume of waste being deposited at landfill sites.

- Existing waste management practices on the base (in line with waste contract arrangements), region and applicable local council area or waste collection service area.

- Expected waste streams and volume to be generated by the facility, including hazardous waste, prescribed waste and liquid waste.

- Strategies to achieve any Defence waste minimisation targets relevant to the site, relevant legislation and base, regional and/or local council or waste collection service area requirements.

- Types, volume and number of bins required to collect the waste generated by the new facility to suit the existing (or proposed) waste management practices.

- Location and capacity of dedicated storage areas allocated to the collection and segregation of recyclables and waste for the facility with consideration of the following as a minimum: existing cleaning contracts, other waste contractor activities/requirements, security issues, base/facility requirements, and adequate access for collection vehicles (space requirements of which should be considered at the earlier stages of design).

  Note: Storage of recyclables may need to be long-term, to capture market cost opportunities (i.e. high price points for recyclables).

- Provision for the waste receptacles to be clearly marked and easily identifiable in accordance with the Australian Standard AS4123.7-2006 Mobile waste containers - Colours, markings and designation requirements.
Appendix F -
Environmental Management Plan

Smart Infrastructure Environmental Management Plan Requirements

The environmental management plan should detail initiatives and management actions to outline how the intent of Smart Infrastructure will be demonstrated during construction through the following (note: this is not an exhaustive list and is specific to addressing the Smart Infrastructure requirements):

- Demonstration that approval conditions/requirements/mitigation strategies identified in information documents such as the Initial Environmental Review (IER) and/or the Environmental Assessment Report (EAR) or similar environmental plan for the project or any relevant existing site management plan have been considered and addressed.
- Elimination or reduction in the use of paints, solvents, adhesives and sealants and washing products, containing toxic or harmful substances.
- Hazardous substance management, and mitigation should spills or leaks occur.
- Implementation of construction waste management Construction Requirements in Section 9.1.
- Implementation of dust, soil and water management Construction Requirements in Section 9.1.
- Adherence to the materials and smart procurement requirements in Section 7.1, where relevant.
- Efficient use of energy needed for lighting, space and water heating, and equipment in:
  - the facility being constructed and
  - site facilities, including offices, cafeteria and washroom facilities, toilets and any other temporary accommodation and storage areas on site.

Note that any measures which are proposed or adopted shall not lower the safety of motorists or pedestrians on walkways and roadways adjacent to the construction site.

- Efficient use of water on site and the preferential use of fit-for-purpose non-potable water, e.g. dust suppression, unless there is no viable alternative.
- Minimising soil disturbance and removal. Where soil is removed it is beneficially reused on the Defence site (unless contamination prevents this) in accordance with Defence contamination guidelines. Where this cannot occur, the soil is beneficially reused off site in accordance with State/Territory legislation and regulations or disposed of by a licensed waste contractor and disposed of in accordance with all relevant regulatory requirements, where contamination prevents beneficial reuse.
- Minimising lighting pollution impact from external lighting provided during construction on neighbouring properties and their occupants and neighbouring ecological areas (external to the construction site), in accordance with Australian Standard 4282 – 1997 Control of the obtrusive effects of outdoor lighting.