1. Introduction

1.1 Purpose of these instructions

These instructions are provided to assist proponents to prepare Environmental Management Plans (EMPs) submitted under Part IV of the *Environmental Protection Act 1986.* EMPs may be provided at referral, during an assessment by the EPA, or required as an implementation condition under a Ministerial Statement. The term 'Environmental Management Plan' is used generically to refer to documents that set out the above information. Documents may be referred to in various ways, e.g. 'Fauna Management Plan' or 'Groundwater Monitoring and Management and Plan'

Some of the EPA's environmental factors have additional guidance on the development of EMPs. Refer to the relevant technical guidance in the EPA's *Framework for environmental considerations in EIA.*

This guidance does not cover the preparation of mine closure plans. Refer to the Department of Mines, Industry Regulation and Safety's (DMIRS) S*tatutory Guideline for Mine Closure Plans* and *Mine Closure Plan Guidance - how to prepare in accordance with the Statutory Guidelines* when preparing mine closure plans. These documents are available on the DMIRS website.

1.2 Purpose of an EMP

The purpose of an EMP is to describe how the environmental impacts of activities related to the implementation of a proposal will be adequately managed. The EPA encourages proponents to submit EMPs during the assessment process.

1.3 How to prepare an EMP

Proponents should understand what is needed in an EMP to adequately demonstrate and communicate how the potential impacts on the environment will be avoided, mitigated, monitored and managed.

An EMP should be a stand-alone document. Information provided in the document should be specific and directly relevant to the purpose of the EMP and able to be read and understood on its own, using clear and concise language. The EMP should not contain an assessment of impacts, but a description of the monitoring and management actions against the potential impacts on the environment.

Cross-referencing to other documents should be avoided, as this may hinder the review of the document and impact on timelines. Where appropriate, documents suitable for cross-referencing may include publicly available documents, those approved by other decision-making authorities and other approved and relevant management plans accompanying the submission.

Proponents may contact the Department of Water and Environmental Regulation (DWER) if they need assistance to prepare an EMP. DWER encourages proponents proposing to develop EMPs that cover more than one Ministerial Statement to consult with DWER, EPA Services Directorate to ensure that regulatory requirements are met.

2. Information for writing an EMP

Before writing an EMP, proponents should be familiar with the four parts to preparing an EMP. Templates for an EMP are provided in Attachments 1 to 5, which follow the instructions.

Part A: EMP essentials – key aspects of developing an effective EMP, including monitoring advice.

Part B: EMP categories – how to decide what type of EMP is appropriate.

Part C: Adaptive management and early response – advice on implementing adaptive management and adopting early response criteria in the EMP.

Part D: Contents of an EMP – advice on what to include in each section of an EMP.

Part A: EMP essentials

Proponents should address the essentials of an EMP to allow efficient and timely evaluation of their plan. Information that is essential for proponents to understand the key aspects of developing an effective, fit-for-purpose EMP include:

- setting outcomes or objectives
- monitoring and evaluation
- indicators.

Essentials Box 1 – Setting outcomes and objectives

Each EMP must have a clearly defined outcome or objective. The outcome or objective will state the overall purpose of the EMP. EMP outcomes or objectives should:

- be specific to the activities that are likely to impact the relevant environmental factor
- directly relate to the proposed mitigation of the impact/s.

Submitting an EMP during assessment is the preferred approach of the EPA, and this will require proponents to define outcomes or objectives of the EMP. If an EMP is required by a Ministerial Statement, the outcome or objective will be within the implementation condition/s.

Outcomes relate to monitoring indicators of environmental impacts, that is, an **outcome** is a specific and measurable result. Objectives will relate to implementation of management actions to mitigate impacts, that is, an **objective** is an intention – aimed at or sought. This is covered in more detail in Part B.

It is not appropriate to set an EMP objective that is the same as the EPA's objective for a key environmental factor. These objectives are too broad and high level to develop appropriate monitoring and management actions to demonstrate compliance.

Outcomes and objectives should be:

- specific and relevant to both the activities affecting the environment and the potential impacts on the affected environmental values
- measurable to enable progress to be quantified to demonstrate that compliance is achieved
- achievable to realistically demonstrate compliance given available resources, knowledge and time, e.g. "no irreversible impacts" is not achievable where it is unknown whether impacts can be reversed
- related to the time scale of potential impacts occurring and where monitoring would detect change prior to an unacceptable impact occurring.

Determining appropriate outcomes and objectives are the pre-cursors to planning fit-for-purpose monitoring and evaluation methodologies.

Essentials Box 2 – Monitoring and evaluation

Monitoring is an essential aspect of an EMP. General information on monitoring and evaluation is provided below to assist proponents in developing scientifically-robust monitoring programs, including recommendations for selecting appropriate indicators.

For monitoring to be effective it should be:

Considered early – monitoring and associated management actions to mitigate potential impacts should be considered at the design stage of a project, including specific timing required to monitor some environmental factors (e.g. flora and vegetation). Well planned monitoring is more likely to be cost effective and efficient.

Evidence-based – evidence-based knowledge should inform the measures used for evaluation and management actions. Where possible, existing published standards for monitoring and evaluation against environmental factors should be applied (e.g. monitoring methodologies for some species listed under the *Environment Protection and Biodiversity Conservation Act 1999* and specific methodologies and criteria for water quality in the EPA Technical Guidance for Marine Environmental Quality and the National Water Quality Guidelines).

Risk-based – monitoring and management actions as well as chosen indicators should align with the significance of both the potential impact/s and the environmental factor/s.

Targeted and specific – indicators selected and proposed management actions should be relevant to the potential impacts, the environmental objective/s and the environmental factor being monitored. Indicators being measured or evaluated should reflect the purpose of the monitoring, not what may be easiest to measure.

Systematic – impacts of the activity and results of mitigation measures should be distinguishable from other influences.

Adequate – the proposed monitoring should be robust enough to detect the potential level of change.

Realistic – management actions (mitigation efforts) and monitoring should be achievable within the timing, resources and capabilities.

Analysed and reported – regular analysis and reporting ensures opportunities to adapt monitoring and management actions.

Designed using **Before-After-Control-Impact** (BACI) to monitor potential impacts.

Monitoring proposals should include:

- **indicators** or **management targets** to be monitored or measured (see Essentials Box 3)
- location of monitoring sites (impact sites, **reference** and/or **control** sites, as appropriate), with number/location of replicates
- information on how the **baseline** condition will be determined, against which impacts will be assessed
- monitoring/sampling methodology and rationale
- timing (e.g. time of year and frequency) and duration of monitoring programs (e.g. until compliance is demonstrated or during a specific project stage)
- methods of statistical analysis (if applicable)
- description of any analytical methods and proposed guidelines or limits of reporting for samples, if applicable (e.g. for water samples).

Essentials Box 3 – Indicators

Deciding what will be monitored and measured is an important step in developing an effective EMP. Correctly defined indicators will enable proponents to track progress and demonstrate compliance.

Indicators are measurable or quantifiable characteristics selected for specific purposes to indicate health or condition of that part of the environment. When selecting indicators, it is useful to consider the range of specific physical, chemical or biological characteristics that can be measured or quantified to represent the health or condition of part of the environment. It is also important to select indicators reflective of the pressure/response relationships within an environment. Repeat measurement of indicators (i.e. monitoring) enables performance against the desired environmental outcome or objective to be assessed.

For example, reduced water quality can affect seagrass health, with water quality being the pressure and seagrass health, the response. There are numerous characteristics that can be measured for water quality (e.g. light, nutrient concentrations etc.) and for seagrass health (e.g. shoot density, leaf number per shoot, biomass, photochemical efficiency etc.). However, it is not practical for monitoring programs to measure all potential characteristics, so several characteristics may be selected to indicate water quality and similarly for seagrass health.

Selected indicators should be:

- unbiased, meaningful and measurable
- part of the causal relationship between a relevant proposal aspect and the impact on the environmental factor/s
- effective for tracking changes relating to the environmental factor/s
- scientifically credible
- straightforward and easy to interpret
- consistent and compatible with other recognised monitoring programs in Australia
- monitored or evaluated regularly.

Part B: EMP categories

The EPA broadly categorises the types of EMPs as outcome-based or objective-based. There may be significant overlap between the two types in the development of robust and effective EMPs. An EMP may contain a combination of both outcome-based and objective-based elements.

B1. Outcome-based EMPs

Outcome-based EMPs are performance-based. They focus on monitoring and evaluating specific measurable outcomes and are typically driven by trigger and threshold criteria. This type of EMP may apply where the part of the environment is capable of objective measurement and reporting.

A template and example tables for outcome-based EMPs are provided in Attachments 2 and 4.

An **outcome** is the proposal-specific desired state for an environmental factor/s to be achieved from the implementation of outcome-based actions. An outcome must be measurable, be relevant to the environmental factor/s and relate to:

- an impact that must be avoided
- a level of impact that must not be exceeded
- a level of protection that must be achieved.

Outcomes generally relate to the 'avoid' step of the mitigation hierarchy. Outcomes are usually defined in terms such as 'maintain' or 'no net-loss'.

Indicators are selected to determine if the outcome is being achieved. The assessment of indicators can be used to evaluate the health or condition for part of the environment.

The EPA has identified two levels of indicators:

a) criteria relating to trigger levels

b) criteria relating to threshold levels.

These criteria must include proposal-specific information such as location, time period, scale and a relative benchmark such as comparison to control or reference sites or to pre-established guidelines such as the National Water Quality Guidelines.

Trigger criteria are the indicators selected for monitoring to provide a warning that if exceeded, the outcome may not be achieved.

Trigger criteria are intended to forewarn of the approach of the threshold criteria and prompt trigger response actions. Trigger criteria must be set at a conservative level to ensure trigger level actions are implemented well in advance of the threshold criteria to avoid non-compliance and to avoid compromising the environmental outcome. Trigger criteria may be set through scientific research, impact assessment or by statutory, regulatory and/or policy requirements.

Threshold criteria are indicators selected to represent the limit of acceptable impact beyond which the environmental outcome is not being met and there is likely to be a significant impact on the environment. Threshold criteria may be set through scientific research, impact assessment or by statutory, regulatory and/or policy requirements.

The **trigger level actions** and **threshold contingency actions** are important considerations after determining the trigger and threshold criteria. These actions are the specific activities and timing that proponents will implement to ensure impacts remain below the trigger or threshold criteria. Actions should be defined in a manner that is easily assessed and audited.

When composing trigger and threshold criteria, proponents should consider:

- the predicted impacts in the environmental review document
- requirements of any conditions in a Ministerial Statement.

For example, it would not be appropriate to apply "clearing of vegetation outside of approved clearing areas" as a trigger, because this would be non-compliant with the defined clearing area in the Ministerial Statement.

B2. Objective-based EMPs

Objective-based EMPs (previously known as management-based EMPs) relate to monitoring and management actions, where specific trigger or threshold criteria may not be appropriate for the circumstances. This may include where insufficient information is known about the environmental system or where all or part of the environment is not capable of being measured against trigger or threshold criteria.

A template and example table for an objective-based EMP are provided in Attachments 2 and 5.

An **objective** is the proposal-specific desired state for an environmental factor/s, to be achieved from the implementation of management actions. An objective must relate to the EPA's environmental objective for a particular factor/s.

Management actions are the identified actions implemented to meet the environmental objective/s. Management actions generally relate to the 'minimise' and 'rehabilitate' steps of the mitigation hierarchy.

Management actions should include auditable timelines, clear identification of record-keeping and reporting against actions and be prioritised using a risk-based approach. The greatest management effort should align with proposal activities that have the highest likelihood of causing environmental impacts, where the consequences of the impacts are severe and likely irreversible.

Management targets are a type of indicator that is defined to demonstrate the objective is being met. They are proposal-specific and used to assess whether the management actions are effective in addressing the identified threat or desired objective. Management targets may be quantitative (e.g. no deaths of particular fauna on haul roads, or impacts of dust on flora are confined to 20 metres from the edge of the mine pit).

A risk-based approach is recommended to identify and prioritise management targets.

Monitoring of progress towards management targets will involve record keeping of actions undertaken and timeframes.

For example, if the objective of management is to ensure that no indirect impacts occur within 50 metres of a development envelope, a target could be related to weed cover. An action related to this target could be to undertake appropriately timed weed inspections and undertake control actions to identified infestations.

B3. Outcome-based vs Objective-based

Questions to consider when deciding between outcome-based or objective-based EMP

1. Is it measurable?
   Yes – outcome-based
   No – objective-based
2. Is it more useful to monitor the impact or the action?
   Impacts – outcome-based
   Actions – objective-based

Outcome-based examples

The proponent shall implement the proposal to ensure no change from the baseline cover and composition of seagrass and macroalgal communities outside the 200 metre buffer zone from the discharge pipe.
Why an outcome? Attributes of the communities (survival, recruitment, percent cover etc.) can be measured and compared to the baseline data.

The construction and operation of the proposal shall not result in an unacceptable decline in water quality of Sandy Creek.
Why an outcome? Water quality is measurable against accepted standards that would be identified in the trigger and/or threshold criteria of the EMP.

During operations the proponent shall ensure that groundwater drawdown of the local calcrete aquifer outcrop does not exceed five metres over an area greater than 50 percent of the local calcrete aquifer extent.
Why an outcome? Groundwater drawdown is measurable and can be identified compared to the baseline data.

Objective-based examples

Implement the proposal to ensure that beach access is to be maintained during operational activities.

Why an objective? Management actions are required to achieve this objective (pedestrian pathways, signage, fencing, notification in local newspapers, coordination with local government, safety actions).

During operations the proponent shall prevent, eradicate and minimise the number of feral animals attracted to the development area.
Why an objective? Management actions are required to achieve this objective (baiting, shooting and trapping regimes, fencing, access to water and food sources).

Implement the proposal to ensure that *Phytophthora cinnamomi* is not introduced into disease free areas by construction activities.
Why an objective? It is management actions that are going to achieve this objective (vehicle cleaning, wash down stations, mapping etc.).

Hybrid examples (both outcome and objective-based)

The proponent shall implement measures to:

(a) ensure noise sensitive premises within 200 metres of the development envelope achieve the day and night time noise levels specified within the EMP; and

(b) minimise noise emissions from the proposal.

Why an outcome? Noise emissions are measurable and need to comply to a standard.

Why an objective? Management actions are required to achieve the objective (cladding, noise attenuation, machinery exclusion zones, separation distances, substitution of equipment).

The proponent shall rehabilitate the section of Long Road from Short Drive to Medium Drive within 12 months of decommissioning this section of road to achieve the following:

(a) provide vegetative cover and fauna habitat and ensure no more than 20 percent bare ground; and

(b) establish an ecological linkage between areas of native vegetation adjacent to Long Road.

Why an outcome? Rehabilitation requires the achievement of the 20 percent completion criteria and threshold and trigger criteria can be defined and measured.

Why an objective? Rehabilitation and the establishment of the ecological linkage involves implementing management actions such as appropriate plant selection, topsoil return, weed control, planting and seeding.

Part C: Adaptive management and early response

C1. Adaptive management

Adaptive management is a systematic approach to improving environmental results and management practices during project implementation through the application of learning from monitoring of outcomes and management actions (Figure 1).

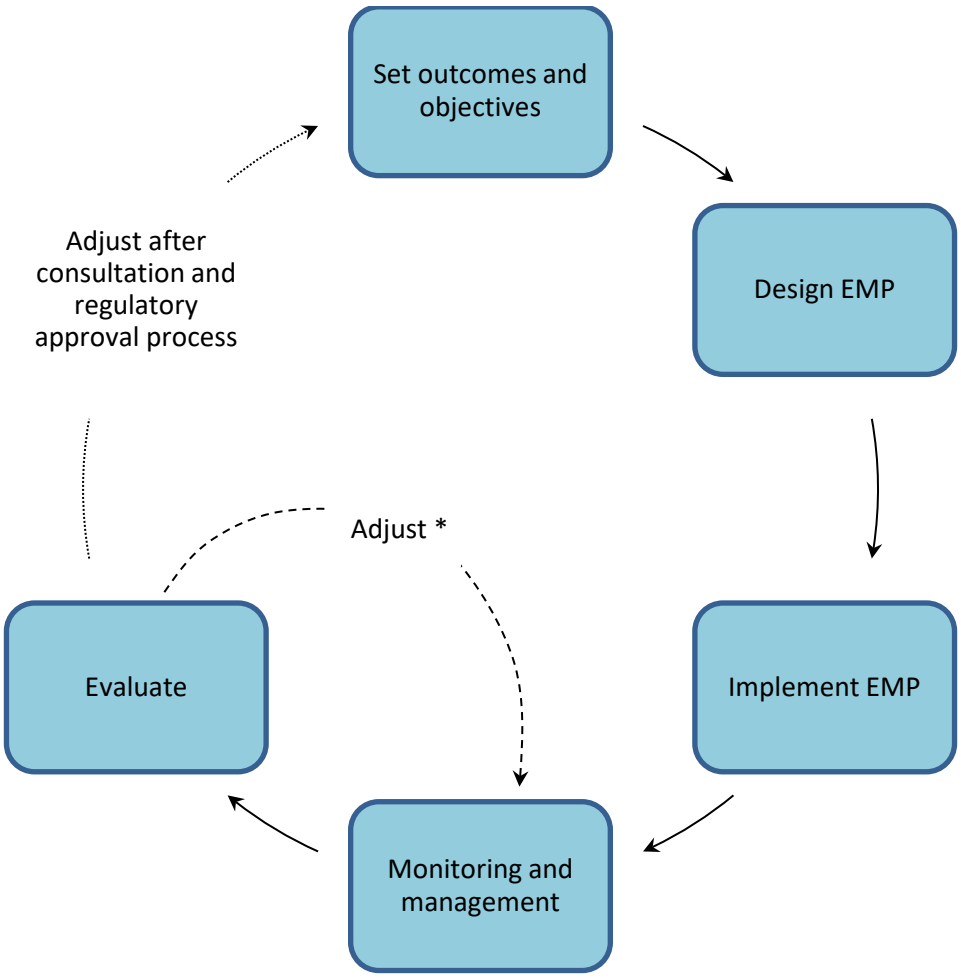
Adaptive management involves more than just reviewing the trigger/threshold criteria and/or management targets following any learning.

Adaptive management in relation to an EMP includes:

- defining the issue and objectives or required outcomes and developing the EMP to address these
- implementing the management and mitigation measures
- monitoring and evaluating the applied management and mitigation against the outcomes and objectives

- adjusting the management and mitigation measures and monitoring (if required) to meet the outcome or objective, based on what is learnt from:
    - evaluation of monitoring data or methodology
    - review of assumptions and uncertainties
    - re-evaluation of risk assessment
    - increased understanding of the ecological system
    - external changes during the life of the proposal (e.g. technical advances or innovation).

Any changes to an EMP will require approval from DWER and may involve consultation with relevant stakeholders.



*Changes will require regulatory approval and may involve stakeholder consultation

Figure 1: Adaptive management cycle for Environmental Management Plans

C2. Early response indicators, criteria and actions

Proponents may choose to adopt **early response indicators** as part of their adaptive management approach. **Early response indicators** provide information on changes that are precursors to an environmental impact. They also support improved understanding and identification of trends in environmental systems. Proponents are encouraged to adopt early response indicators.

Situations where early response indicators may be appropriate:

- where loss or mortality is irreversible in human time scales (e.g. loss of coral communities)
- where impacts may not be detected for a prolonged period (e.g. impacts on recruitment of a long-lived species)
- complex environmental systems where long-term trends need to be established or where consequences of potential impacts are not well understood (e.g. long-term impacts of dewatering on groundwater systems).

Early response criteria are predefined states or levels or early response indicators that are used to initiate early response actions before or at the onset of an environmental impact. Early response actions may include investigations to determine the potential causes of exceedances of criteria, the analysis of additional data sets and/or more frequent monitoring to decrease uncertainty/increase certainty in observed monitoring results.

Part D: Contents of an EMP

An EMP template and examples tables are provided at the end of these instructions. The template provides the structure of an EMP and the minimum requirements that DWER, EPA Services Directorate needs to assess and/or approve the plan. The EPA expects that proponents follow the EMP template (unless otherwise agreed with DWER) so that the EMP is concise and addresses the necessary information.

The EMP template provides flexibility for proponents to prepare EMPs that:

- cover one or more key environmental factors for a proposal
- cover one or more operations or Ministerial Statements.

EMPs prepared for multiple operations or a region must include proposal-specific information for each proposal, where required by the implementation conditions of Ministerial Statements. A schedule may be provided for each operation or Ministerial Statement.

The headings below correspond to the recommended template for EMPs provided at the end of these instructions.

Version control
Include a table at the front of the EMP with version, date and authorisation (name and signature). Indicate if the EMP is for initial or revised approval. Indicate approval from the proponent's Chief Executive Officer or delegate, if required.
Summary
Provide a summary table of the following information (template in Attachment 1): • proposal name • proponent name • Ministerial Statement number/s (if applicable) • purpose of the EMP (e.g. Environmental Scoping Document requirement or implementation condition/s requirement) • key environmental factor/s, outcome/s and/or objective/s • condition clauses (if applicable) • key components or legal requirements of the plan* • proposed construction and operation dates (MM/YYYY) • EMP required pre-construction? Yes/No.

*Note: This may not be required for EMPs that adequately address the requirements in a table (see Section 2) using the preferred template table (Attachment 2).

1. Context, scope and rationale

1.1 Proposal

Briefly describe the aspect of the proposal that the EMP addresses.

1.2 Key environmental factors

For each key environmental factor succinctly describe:

- proposal activities that would affect the key environmental factor
- site-specific environmental value, existing and/or potential uses, ecosystem health condition or sensitive component of the key environmental factor, which will be affected.

1.3 Condition requirements

Provide a table of the Ministerial Statement condition requirements (including any outcomes/ objectives) if applicable, and in which section of the EMP they are addressed. This may be provided in the components table (see Section 2) or in an Appendix or Schedule if there are multiple conditions and/or condition clauses.

1.4 Rationale and approach

Provide a concise description of the rationale and approach for the EMP. This should not include an impact assessment summary, but rather focus on providing information which directly supports the proposed rationale for monitoring and management actions that aim to address the outcomes and objective/s.

Provide information on:

- Environmental outcome or management objective/s
  - outcomes and objectives should relate to the potential impacts identified in the Environmental Review Document, where applicable
  - describe how monitoring and management will assist in demonstrating compliance with the environmental outcome/s or objective/s.
- Survey and study findings (e.g. specific information about the factor/s of interest that provides context to the rationale for the proposed monitoring of indicators and implementation of management actions)
  - the body of scientific information/site/regional information available
  - regional approach, if used.
- Key assumptions and uncertainties.
- Objective-based EMPs – risk-based approach to identify and prioritise targets and actions.
- Rationale for choice of indicators and/or management actions
  - application of early response indicators and criteria, if used
  - expected changes in the intensity, duration, magnitude or geographic footprint of the impact
  - expected changes and rate of changes in the environment
  - possible effects of issues external to the proposal (e.g. rainfall, land use, other users)
  - expected timeframe for mitigation to take effect.

2. Key components of an EMP

Broadly, the key components of an EMP include:

- the environmental outcome/s or objective/s
- what is being monitored and why
- how and when the monitoring will be done
- how the results will be evaluated and interpreted
- the actions and timelines for the relevant management response/s.

The key components may be covered under outcome-based or objective-based EMPs, or a combination of both depending on the environmental issue/s and any approval condition requirements that the document aims to address. The EMP may contain a single outcome or objective or multiple outcomes/objectives that intersect with both broad categories of EMPs.

Proponents should provide detail on the components of the EMP:

- in a table/s (see template in Attachment 2) and/or
- as succinct text, using clear, unambiguous language.

The table/s may be provided as separate schedules for EMPs that cover more than one operation or Ministerial Statement.

Condition requirements

Where the EMP is a requirement of a condition, this section must include the relevant condition numbers and the specific details the condition/s (see template in Attachment 2).

2.1 Outcome-based EMPs

1. **Outcome** – describe the outcome/s being addressed in the EMP. Where the EMP is a requirement of a condition, this will include any other information required by the condition.
2. **Indicators** – identify the **indicators** selected for monitoring to assess potential environmental impacts. This includes identifying the appropriate indicators for **trigger criteria**, which provide early warning of potential impacts and **threshold criteria**, which determine the limit of acceptable impact.
3. **Response actions** – identify the **trigger level actions** and **threshold contingency actions** relevant to the outcome/s of the EMP.
4. **Monitoring** – describe the proposed monitoring plan (e.g. design, methods and analysis) to measure indicators against the outcome and when trigger level actions and threshold contingency actions need to be implemented.
5. **Reporting** – identify the reporting requirements relating to the implementation of the plan, including timelines that are defined and auditable. Where the EMP is a requirement of a condition, this will include information required by the condition. Reporting may include:
    - annual reporting of monitoring results and trends compared to trigger and threshold criteria
    - reporting any exceedance of threshold criteria within a set timeframe
    - reporting on threshold contingency actions that have been implemented due to the exceedance of threshold criteria.

2.2 Objective-based EMPs

1. **Objective** – define the objective/s that the plan seeks to achieve. The objective/s must relate to the EPA's objective for a specific environmental factor/s. Where the EMP is a requirement of a condition, this will include any other information required by the condition.
2. **Management actions** – clearly identify the management actions identified to meet and achieve the objective/s. Prioritising management actions using a risk-based approach should

be clearly demonstrated, with the greatest effort applied to proposal activities with the highest likelihood of causing environmental impacts where the impact consequence is severe and likely irreversible.

3. **Management targets** – identify the management targets, with timelines where appropriate. These should be specific, relevant and auditable to determine whether the management actions are effective.
4. **Monitoring** – describe the monitoring plan (e.g. design, methods and analysis) proposed to determine whether the management targets are effective against the objective/s and the management actions are effective.
5. **Reporting** – outline the reporting requirements relating to the implementation of the plan, including timelines that are defined and auditable. Where the EMP is a requirement of a condition, this will include information required by the condition. Reporting may include:
    - annual reporting of monitoring results and trends against management targets
    - reporting of any exceedance of management targets, within a set timeframe
    - reporting on the review and revision of management actions.

3. Adaptive management and review of the EMP

Identify and discuss the adaptive management approach for the EMP and the process for the review of the EMP (see Part C). Identifying mechanisms that are pro-active and responsive to changing management actions, which directly improve outcomes and objectives are encouraged.

Where the EMP is a requirement of a condition, proponents must seek formal approval from DWER to amend an EMP based on information gained through adaptive management.

3.1 Early response indicators, criteria and actions

If appropriate, identify the **early response indicators** selected as part of the adaptive management approach. Include the necessary **early response criteria, early response indicators**, and **early response actions** as part of the adaptive management section of the EMP, including the rationale and approach as recommended for selecting indicators in the beginning of the document.

Early response criteria and actions may be required in an EMP through a condition, where critical environmental factors may be impacted and there is a high degree of uncertainty about likely impacts.

Example: Early response indicator and adaptive management

Outcome-based EMP: For managing the impacts of a desalinisation plant brine discharge on seagrass health.

Outcome: At the boundary of 200 metres (m) from the ocean discharge point there will be no significant reduction in seagrass health relative to suitable un-impacted reference sites.

Indicators: The water quality indicator is the concentration of salt in seawater measured as electrical conductivity millisiemens per centimetre (mS/cm). The seagrass health indicator is the number of shoots per square metre.

Early response indicator: The median concentration of salt in brine *prior* to discharge is greater than a pre-determined level over a three-day period. The pre-determine level is back-calculated from the salinity trigger criterion to be achieved at the 200 m boundary, taking into account the number of dilutions achieved by the discharge over that distance.

Trigger criteria: The median concentrations of salt in water at the seabed 200 m from the discharge pipe is greater than the 80th percentile of an un-impacted reference site over a rolling two-week period.

Threshold criteria: A 10 percent or greater reduction in the number of seagrass shoots per square metre measured at the 200 m boundary compared to seagrass shoot density measured at the un-impacted reference sites.

Rationale for the choice of the early response indicator
The brine discharge from desalinisation plants is negatively buoyant and can increase the salinity of the bottom waters surrounding the discharge point and affect seagrass health. In this example, the trigger is the salinity measured at 200 m from the outfall, and the threshold is impacts to seagrass health also at 200 m from the outfall. The early warning criteria is measurement of the salinity of the brine in the pipe *prior* to discharge, i.e. prior to any environmental impacts to water quality or seagrass health.

Response Actions

Early Response Actions:
If the concentration of salt in the brine wastewater is above the predetermined level then check that the equipment is working correctly and make any adjustments necessary to bring the salinity of the brine back down to expected operational levels.

Trigger Criteria Actions:
If salinity in bottom waters at the 200 m boundary is greater than the 80th percentile of an un-impacted reference site(s), then brine will be diluted with seawater to ensure the trigger criteria is achieved. Seagrass health will also be assessed against the threshold criteria within one month of the trigger criteria exceedance.

Threshold Criteria Actions:
If seagrass shoot density is decreased by 10 percent or greater compared to un-impacted reference sites, then action should be taken to reduce the impacts of the brine discharge. It would also suggest that the trigger criteria may be too high and need revision. Actions that could be taken to reduce the impacts include: seawater dilution prior to discharge, reduced volume of discharge, modification of the diffuser and/or the addition of another diffuser.

Monitoring

Salinity levels will be monitored at two locations:

1) in the brine prior to discharge; and

2) at multiple points around the 200 m boundary.

In-pipe salinity levels will be measured in-situ using a probe with an instantaneous readout. Salinity levels at the 200 m boundary in the ocean will be measured using telemetered loggers on the seabed.

Seagrass health will be routinely monitored annually in January, but if trigger criteria are exceeded then seagrass health will also be monitored within one month of the exceedance.

4. Stakeholder consultation

The EPA and DWER expect proponents to consult with stakeholders (including decision-making authorities and other government agencies) when preparing EMPs. The EMP must summarise the stakeholders consulted with, comments and advice received on the key environmental issues, and the proponent's response to these comments/issues, in tabular form.

5. Changes to an EMP

If the EMP is a revision of a previously approved EMP, the proponent must provide a table summarising the changes following the example template (see Attachment 3). The summary table of changes must clearly indicate location and reason/s for changes. A tracked-change version of the revised EMP should be provided where possible and for all minor, non-structural changes to the document.

All changes to an EMP post-assessment must be provided separate to compliance reports and submitted to registrar@dwer.wa.gov.au.

Figures, tables, schedules, and appendices

Include the following where relevant to support the information in the EMP:

- Figures – maps, figures and diagrams for explanation and context (e.g. location of monitoring sites, buffers, etc.).
- Tables – summary, key EMP components, Ministerial Statement conditions and table of changes for revised EMPs. Examples are provided in Attachments 1 to 5.
- Glossary – include definitions for terms that are not in common use. Terms that are defined in the approved conditions or EPA factors/objectives should retain the same meaning as that used in the condition.
- Schedules (optional) – for EMPs that cover more than one operation or Ministerial Statement.
- Appendices – supporting technical information may include baseline survey reports, supplementary modelling reports or scientific studies, risk assessments or other relevant information.

Recommendation: summarising monitoring requirements and management actions in a table will assist with a timely, efficient review and auditing of the EMP. Proponents should ensure that all information is clearly presented and requirements are easily identified in the EMP (see Attachments 1 to 3).

Submitting and publishing an EMP

Submitting an EMP

The EPA prefers that documents are emailed but will also accept documents submitted by post.

Email: registrar@dwer.wa.gov.au or EPA Services
Department of Water and Environmental Regulation
Locked Bag 10, Joondalup DC, WA 6919

Enquiries:
Telephone: 6364 7000
Email: info.epa@dwer.wa.gov.au

Fax: 6364 7001
Website: www.epa.wa.gov.au

Publishing an EMP

The EPA may publish approved EMPs on the EPA website.

Index of Biodiversity Surveys for Assessments (IBSA) and Index of Marine Surveys for Assessments (IMSA)

IBSA and IMSA are mechanisms where terrestrial biodiversity survey and marine survey information collected for environmental impact assessment under the *Environmental Protection Act 1986* will be captured and integrated into a consolidated, indexed and publicly available repository. IBSA and IMSA are administered by DWER on behalf of itself, the EPA and DMIRS.

If an EMP requires a terrestrial biodiversity or marine survey, then a data package must be submitted for inclusion in IBSA and/or IMSA. This is not required for data collected through monitoring.

IBSA data packages should be submitted via the online IBSA Submissions portal in accordance with the *Instructions and Form: IBSA Data Packages* and IMSA data packages should be provided in accordance with the *Instructions and Form: IMSA Data Packages*.

A guide demonstrating how to submit IBSA survey information and Frequently Asked Questions are available online.

Definitions

Baseline studies are the environmental studies undertaken prior to an area being subject to pressures or effects from a development or proposal activities occurring. Baseline studies should be undertaken at both the impact site and the reference site prior to potential impacts.

Baseline condition are the environmental conditions prior to being subject to pressures from a development or operation of concern. This may include natural environmental conditions that are largely un-impacted by human influences or the state of the environment just prior to influences and effects of development.

Before-After-Control-Impact (BACI) design is a method to evaluate natural and project-induced change on environmental factors, based on information collected against selected indicators both before and after potential impacts. Both spatial and temporal considerations of selected indicators are important to the BACI design.

Control site is a site located in an area that is unaffected by a pressure being monitored and used for determining baseline conditions/quality prior to becoming influenced by the pressure of concern.

Early response actions are the specific activities selected to implement if early response criteria are exceeded.

Early response criteria are the indicators selected to provide information on changes to the environment that are precursors to an environmental impact.

Early response indicators are the measurable or quantifiable characteristics selected, typically in conjunction with other indicators, to provide information on changes to the environment that are precursors to an environmental impact. They may initiate early response actions before or at the onset of an environmental impact.

Environmental criteria is a term that was previously used in EPA documents to represent the quantitative values indicator and proposal-specific indicators such as location, time period, scale and a baseline or reference. The EPA now refers to this information using the term **indicator**.

Indicator is a measurable or quantifiable characteristic selected for specific purposes to indicate health or condition of that part of the environment.

Management actions are the identified actions implemented to meet the environmental objective.

Management targets are a type of indicator that is defined to demonstrate that the objective is being met.

Parameter is a term that was previously used in EPA documents to represent measurable or quantifiable characteristics. The EPA now refers to this information using the term **indicator**.

Reference site is a site located in a similar system, or in a location that experiences similar natural environmental conditions as an area being monitored or managed, but largely un-impacted by human influences and used as a benchmark for determining the environmental objective/s targeted in an EMP. A reference site may not always be available to benchmark and proponents must carefully consider and justify alternative measures.

Threshold criteria are the indicators that have been selected to represent the limit of acceptable impact beyond which the environmental outcome is not being met and where there is likely to be a significant impact on the environment.

Threshold contingency actions are the planned actions for implementation if threshold criteria are exceeded. Threshold contingency actions must be decisive actions that will quickly bring the impact to below the threshold criteria and trigger criteria.

Trigger criteria are indicators that have been selected for monitoring to provide a warning that if exceeded the outcome may not be achieved. They are intended to forewarn of the approach of the threshold criteria and trigger response actions.

Trigger level actions are the planned actions for implementation if trigger criteria are exceeded, to avoid reaching the threshold criteria and bring the impact back below the trigger criteria.

End of instructions. Environmental Management Plan templates are on the next pages.

Summary (template in Attachment 1)

1. Context, scope and rationale

1.1. Proposal

1.2. Key environmental factor/s

1.3. Condition requirements

1.4. Rationale and approach

- Survey and study findings
- Key assumptions and uncertainties
- Objective-based EMP – risk-based approach
- Rationale for choice of indicators and/or management actions

2. EMP Components (template in Attachment 2)

Outcome-based EMPs

- Outcome
- Indicators (trigger criteria and threshold criteria)
- Response actions (trigger level actions and threshold contingency actions)
- Monitoring
- Reporting

Objective-based EMPs

- Objective
- Management actions
- Management targets
- Monitoring
- Reporting

3. Adaptive management and review of the EMP

4. Stakeholder consultation

5. Changes to an EMP table (template in Attachment 3) *[if required]*

Figures

Tables

Glossary *[if required]*

Schedules *[optional]*

Appendices *[if required]*

Attachment 1

Template table: EMP executive summary

Proposal name	
Proponent name	
Ministerial Statement number	
Purpose of the EMP	EXAMPLE TEXT: Provide management and monitoring actions for flora and vegetation and terrestrial fauna in accordance with the objectives of conditions 6-1 and 7- 1 of Ministerial Statement (MS) 10XX
Key environmental factor/s, outcome/s and objective/s	Provide a summary list of the objectives/outcomes against each key factor that is addressed by the EMP. *EXAMPLE TEXT: The environmental objectives/outcomes for flora and vegetation and terrestrial fauna are:* ***Factor:*** • *List the objective(s) or outcome(s)* **Flora and Vegetation:** • Prevent the introduction of new weed species and ensure there is no net increase in the current extent of weed species within the mine development envelope shown in Figure 1 and described in the spatial data in Schedule 1 as a result of the implementation of the proposal. • Ensure no proposal-related direct or adverse indirect impacts to flora and vegetation within the exclusion areas as shown on Figure 1 and delineated by coordinates in Schedule 1. **Terrestrial Fauna:** • Ensure no proposal-related direct or adverse indirect impacts to terrestrial fauna and short-range endemic within the exclusion zones as shown on Figure 1 and delineated by coordinates in Schedule 1.
Condition clauses (if applicable)	
Key components in the EMP (if applicable)	Note: this may not be required for EMPs that adequately address the requirements in a table (see Section 2) using the preferred template tables (Attachment 2).
Proposed construction date	MM/YYYY
EMP required pre-construction?	Yes ☐ No ☐

Attachment 2

Template table: Outcome-based EMP

Purpose of EMP: [Example Text] *To meet legal requirements of condition X of Ministerial Statement XXXX*

Rationale:

	EPA factor/s and objective/s: **Outcome/s:** State outcome (and condition clause number, if applicable) **Key environmental values:** **Key impacts and risks:**			
Outcome-based				
• **Trigger criteria** • **Threshold criteria**	**Response actions:** • **Trigger level actions** • **Threshold contingency actions**	**Monitoring**	**Timing / frequency of monitoring**	**Reporting**
Condition clause number and text				
Trigger criterion 1 Threshold criterion 1	Trigger level actions (and timing to implement) Threshold contingency actions (and timing to implement)	Indicator Method for data collection and analysis Location of monitoring sites (including reference or control sites) (see Figure xx)	Identify the timing / frequency (auditable format) - may distinguish frequency based on construction / proposal phase	Annual reporting Reporting on exceedance of trigger criteria and threshold criteria (and timing of report) Reporting on trigger level and threshold contingency actions
Trigger criterion 2 Threshold criterion 2 etc	Trigger level actions Threshold contingency actions	Indicator Method for data collection and analysis Location of monitoring sites (including reference or control sites) (see Figure xx)	Identify the timing / frequency (auditable format) - may distinguish frequency based on construction / proposal phase	Annual reporting Reporting on exceedance of trigger criteria and threshold criteria (and timing of report) Reporting on trigger level and threshold contingency actions

Template table: Objective-based EMP

Purpose of EMP: [Example text] *To meet legal requirements of condition X of Ministerial Statement XXXX*

Rationale:

	EPA factor/s and objective/s: **Objective/s:** State management-based objective/s (and condition clause number, if applicable) **Key environmental values:** **Key impacts and risks:**			
Objective-based				
Management targets	**Management actions**	**Monitoring**	**Timing / frequency of actions**	**Reporting**
Condition clause number and text				
Management target 1	Management action 1 (and risk-based priority and timing)	Indicator Method for data collection and analysis Location of monitoring sites (including reference or control sites) (see Figure xx)	Identify the timing / frequency (auditable format) - may distinguish frequency based on construction/ proposal phase	Annual reporting Reporting on exceedance of management target Review management actions (and revise if required) Reporting on the review and revision of management actions
Management target 2	Management action 2 (and risk-based priority and timing) etc	Indicator Method for data collection and analysis Location of monitoring sites (including reference or control sites) (see Figure xx)	Identify the timing / frequency (auditable format) - may distinguish frequency based on construction/ proposal phase	Annual reporting Reporting on exceedance of management target Review management actions (and revise if required) Reporting on the review and revision of management actions

Attachment 3

Template table: Changes to EMP

Complexity of changes			**Minor revisions** ☐	**Moderate revisions** ☐	**Major revisions** ☐
Number of Key Environmental Factors			**One** ☐	**2-3** ☐	**> 3** ☐
Date revision submitted to EPA: DD/MM/YYYY					
Proponent's operational requirement timeframe for approval of revision **Reason for Timeframe:**				**< One Month** ☐ **< Six Months** ☐	**> Six Months** ☐ **None** ☐
Item no.	**EMP section no.**	**EMP page no.**	**Summary of change**	**Reason for change**	
1.					
2.					
3.					

Attachment 4

Example table – Outcome-based EMP*

Management of waste water outfall discharges and impacts to seagrass health
Rationale: Elevated nutrients in waste streams may increase phytoplankton levels, which reduces water clarity and/or increases epiphytic algal growth on seagrass leaves resulting in a shading effect. This may lead to reduced photosynthesis and thinning of seagrass meadows, which could result in the loss of the seagrass community.

	EPA Factor: Benthic Communities and Habitats **EPA Objective:** ***To protect benthic communities and habitats so that biological diversity and ecological integrity are maintained*** **Outcome:** Beyond a boundary defined as a 100 metre circumference around the outfall there will be no significant reduction in the density of seagrass shoots relative to suitable un-impacted reference sites. **Key environmental values:** water quality, seagrass communities **Key impacts and risks:** reduction in seagrass health affecting the wider seagrass community			
Outcome-based				
Indicators:) • **Trigger criteria -** Photosynthetically Active Radiation (PAR) • **Threshold criteria -** Seagrass shoot density	**Response actions:** • **Trigger level actions** • **Threshold contingency actions**	**Monitoring**	**Timing / frequency of monitoring**	**Reporting**
Condition clause 6.X				
Trigger criteria: The median PAR at the seabed over a rolling two-week period at any site at or beyond the 100 metre boundary is below the 20th percentile of PAR measurements taken at suitable un-impacted reference sites. **Threshold criteria:** Median seagrass shoot density at any site where the trigger criteria have been exceeded is below	**Trigger criteria action:** If seabed PAR over a rolling two-week period is below than the 20th percentile of the reference site then a monitoring program will be implemented to measure seagrass shoot density at the site where the trigger was exceeded. **Threshold criteria action:** If the seagrass shoot density falls below the 20th percentile of the reference site then waste water quality will be improved within three months by increasing treatment and/or the performance of the	**Indicators:** PAR, seagrass shoot density. PAR will be monitored using a logger at the 100 metre boundary, which will be downloaded and serviced every two weeks. Seagrass shoot density will be monitored in the event of trigger criteria exceedance, or annually if water quality triggers are met.	PAR will be monitored daily using a logger, starting in month, year, X days pre-construction. Seagrass shoot density will be monitored annually during X month, or in the event of trigger criteria exceedance.	In the event of an exceedance of a trigger or threshold criteria, the proponent will report the exceedances to DWER within one week of the detected exceedance. In the absence of exceedances, water quality reporting will be on a quarterly basis and seagrass reporting will be annual. All reports are to be sent to the Compliance Branch at DWER.

the 20th percentile of seagrass shoot density at suitable un-impacted reference sites.	diffuser to achieve the trigger criteria and seagrass shoot density will continue to be measured until the threshold criteria has been re-achieved.	PAR and seagrass shoot density will be monitored at five impact sites and two un-impacted reference sites. Location of monitoring sites (see Figure xx)		

*Note that this is a simplified, abbreviated example, intended to assist readers to understand an outcome-based EMP. The numbers and values used are not scientifically derived and these need to be developed for each individual project based on the nature of the project and the environment in which it occurs. Similarly, the actions, monitoring, timing and reporting are for illustrative purposes only and should be fully developed for the purpose of each project.

Example table – Outcome-based EMP*

Maintain water quality for inland water for an infrastructure project

Rationale: In accordance with condition 6.X, threshold criteria are required to be consistent with the Australian Drinking Water Guidelines. In accordance with condition 6.X, trigger criteria are required to be established with reference to site specific water quality data or baseline survey water quality data.

	EPA Factor: Inland Waters **EPA Objective:** ***To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected*** **Outcome:** The construction and operation of the proposal shall not result in an unacceptable decline in water quality of the Inland Water as confirmed by monitoring for a period of X years post construction. **Key environmental values:** groundwater, surface water and basin sediment quality **Key impacts and risks:** infrastructure construction activities			
Outcome-based				
Surface water quality analytes • **Trigger criteria** • **Threshold criteria**	**Response actions:** • **Trigger level actions** • **Threshold contingency actions**	**Monitoring**	**Timing / frequency of monitoring**	**Reporting**
Condition clause 6.X				
Trigger criteria: Specific selected analytes set at guideline values (e.g. aluminium, arsenic, copper, etc.) **Threshold criteria:** Specific selected analytes values + 115	**Trigger Criteria Action** 1. Investigate if the cause for change is due to the construction or operation of the proposal, the exceedance is considered project attributable and the trigger criteria are considered to have been exceeded.	**Indicators:** Surface water quality analytes Analytes will be collected at ## monitoring locations within and adjacent to the development envelope.	Monitoring will start in month, year, X days pre-construction, during construction and post-construction. Analytes will be monitored monthly.	In the event of an exceedance of a trigger or threshold criteria, the proponent will report the exceedances to within one week of the detected exceedance. In the absence of exceedances,

% of trigger level (e.g. aluminium, arsenic, copper, etc.)	*For project attributable exceedances of trigger criteria*: 2. Resample affected monitoring location as soon as practicable and review the result not later than one week following resampling. 3.If both rounds of monitoring show trigger levels have been exceeded, increase frequency of monitoring to further assess changes. 4. Notify the Chief Executive Officer (CEO) within seven days of becoming aware of the exceedance. 5. Identify and implement relevant alternative activities that do not contribute to the exceedance. 6. Identify additional measures required to prevent the trigger level being exceeded in the future. **Threshold Criteria Action:** As for Trigger Criteria Actions, plus the following: Regardless of whether the threshold exceedance is project-attributable, provide a report to the CEO within 60 days from the date of awareness of the exceedance. Document the threshold exceedance for later inclusion in the annual Compliance Assessment Report.	Analytes will be collected from X sites from nearby wetland for reference sites. All sampling is to be undertaken in accordance with Australian Standard X Water Quality-Sampling and standard operating procedure. Location of monitoring sites (see Figure xx).		surface water quality reporting will be on annual basis. All reports are to be sent to the Compliance Branch at DWER.

*Note that this is a simplified, abbreviated example, intended to assist readers to understand an outcome-based EMP. The numbers and values used are not scientifically derived and these need to be developed for each individual project based on the nature of the project and the environment in which it occurs. Similarly, the actions, monitoring, timing and reporting are for illustrative purposes only and should be fully developed for the purpose of each project.

Attachment 5

Example table – Objective-based EMP*

Management of indirect impacts to flora and vegetation for an infrastructure project

Rationale: The management approach has been informed by best practice and recent experience on similar infrastructure projects in Western Australia. The hierarchical approach taken focuses on management aims to minimise indirect impacts to flora and vegetation.

	EPA Factor: Flora and Vegetation **EPA Objective:** ***To protect flora and vegetation so that biological diversity and ecological integrity are maintained*** **Objective:** To ensure that indirect impacts, including but not limited to weeds, unauthorised access, increased fire risk and litter, changes to surface water regimes, to flora and vegetation are minimised as far as practicable. **Key environmental values:** flora and vegetation, including threatened flora and ecological communities **Key impacts and risks:** vegetation loss and degradation through indirect impacts			
Objective-based				
Management targets	**Management actions**	**Monitoring**	**Timing / frequency of actions**	**Reporting**
Condition clause 6.X				
Management target 1: Limit the extent of indirect impacts to no more than 10 metres from the new edge of native vegetation adjacent to Conservation Category Wetlands. Management target 2: Maintain the number of individuals of threatened flora species X in the road reserve.	1. Manage weeds and disease in accordance with the approved X EMP to minimise their introduction and establishment. 2. Manage newly identified declared weeds within the development envelope in accordance with the *Biosecurity and Agriculture Management Act 2007* and subsidiary regulations. 3. Undertake periodic weed spraying to control weeds. 4. Establish landscaping and/or revegetation on roadside as quickly as practicable post-construction to reduce the risk of roadside weed establishment and invasion of adjacent native vegetation.	**Indicator:** Number and condition of threatened flora species X. Visual observation of selected indicators within buffer established around known threatened flora species X. Photographic record of buffer. Location of monitoring sites (see Figure xx)	Reference condition recorded, starting in Spring month, year, X days pre-construction. Threatened flora species X will be monitored quarterly during construction and quarterly for X years post-construction.	Reporting against both management actions and targets will be on annual basis. All reports are to be sent to the Compliance Branch at DWER.

*Note that this is a simplified, abbreviated example, intended to assist readers to understand an objective-based EMP. The numbers and values used are not scientifically derived and these need to be developed for each individual project based on the nature of the project and the environment in which it occurs. Similarly, the actions, monitoring, timing and reporting are for illustrative purposes only and should be fully developed for the purpose of each project.