

# Fauna Impact Assessment Guidelines

EHTM Attachment 5A

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## Abbreviations

Term / Acronym	Meaning
ALA	Atlas of Living Australia
BDSA	Biological Database of South Australia
CEMP	Contractor's Environmental Management Plan
DAWE	Department of Agriculture, Water and the Environment (Commonwealth)
DEW	Department for Environment and Water (SA)
DIT or the Department	Department for Infrastructure and Transport
DotE	Department of the Environment (Commonwealth) which was superseded by DAWE
EHIA	Environment and Heritage Impact Assessment
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
EHTM	Environment and Heritage Technical Manual
FM Act	Fisheries Management Act 2007
LSA Act	Landscape South Australia Act 2019
Minister	Australian Government Environment Minister
MNES	Matters of National Environmental Significance protected under the EPBC Act
NPW Act	National Parks and Wildlife Act 1972
NV Act	Native Vegetation Act 1991
NVC	Native Vegetation Council
PMST	Protected Matters Search Tool
RSPCA	RSPCA Australia
VIA	Vegetation Impact Assessment

## Glossary

Term	Meaning
Aspect	Aspects relevant to this Guideline include: noise, vegetation, air quality, water quality, Aboriginal heritage, contamination etc.
Contract Documentation	Contract Scope and Technical Requirements; Functional and Operational Requirements; Contract or Project Scope
Contractors	Contractor engaged by the Department to undertake the planning, design or construction of a project (including maintenance projects)
Fauna	For the purposes of these guidelines, fauna are defined as animals (mammals, reptiles, fish, amphibians and birds) which are indigenous to South Australia or migrating through South Australia
Fauna Habitat	The environment of an animal(s) that provides a suitable place for them to live (for example to breed, forage, roost, migrate or seek refuge).
High Value Fauna Habitat	Habitat that is important to key life cycle phases of fauna (for example breeding, feeding, nesting or aggregation areas) or unique or isolated habitat (for example, wetlands) within the landscape or region.
Impact	The effect of an action on an aspect.
PPMF	Program and Project Management Framework
Project Area	Area in which a project can have an effect on environmental and heritage aspects. Includes the construction, operational and maintenance footprints
Significant Impact	Significant impact is to be determined following consideration of the EPBC Act significant impact criteria.
Master Specification	The Department's Master Specification sets out the requirements to achieve the quality and/or performance outcomes expected for planning/design, construction projects, maintenance and professional services.

# 1 Introduction

The Fauna Impact Assessment Guideline forms Attachment 5A of the Department's Environment and Heritage Technical Manual (EHTM). This document applies to a range of Department programs and projects including road, rail, marine and other infrastructure, as required. The document applies to employees of the Department (either direct or contracted) and others operating under the direction of the Department.

The purpose of this document is to detail the processes to be followed when assessing and mitigating potential impacts to fauna.

It is expected that, unless otherwise approved by the Department, Contractors undertaking the works described in this document are listed on, or eligible for listing on, the Department's Professional and Technical Services Prequalification Panel for Environmental Planning and Vegetation Services (if undertaking survey works).

## 1.1 Supporting Documentation

The following Departmental documentation support/ form part of assessments undertaken under this Guideline and are available via the Department's website:

- Vegetation Survey Guidelines
- Vegetation Impact Assessment Guidelines
- Underwater Piling and Dredging Noise Guidelines

## 1.2 Performance Outcomes

To meet the performance requirements under this Guideline, unless specified otherwise in the Contract documentation, the following shall be achieved:

- Fauna impact assessment and reporting that demonstrates compliance with applicable legislation and relevant Standards and Guidelines;
- Identification of potential impacts to fauna during the construction and operation of the project;
- Minimise the destruction or disturbance of fauna habitat and provide safe fauna passage and habitat connection, where feasible during construction and operation of the project; and
- Obtainment of the necessary approvals for fauna impacts prior to such impacts occurring.

## 1.3 Legislative Context

Users of this Guideline are responsible for complying with relevant legislation and obtaining relevant approvals, permits or authorisations. The following legislation may apply to departmental construction, demolition, operation and maintenance activities associated with transport and building (including property) related infrastructure:

- *Environment Protection and Biodiversity Conservation Act 1999* (Cwth) (EPBC Act);
- *National Parks and Wildlife Act 1972* (SA) (NPW Act);
- *Native Vegetation Act 1991* (NV Act) and *Native Vegetation Regulations 2017* (SA) ;
- *Landscape South Australia Act 2019* (SA) (LSA Act);
- *Fisheries Management Act 2007* (SA) (FM Act);
- *Animal Welfare Act 1985 and Regulations 2012*.

Noting that any handling or trapping of fauna would as a minimum require Wildlife Ethics Permit and Department for Environment and Water (DEW) Scientific Permit.

## 2 Fauna Impact Assessment Process

The process outlined in this section is intended as a guide. Actual requirements will differ depending on the type of fauna or fauna habitat present; nature of impact and the project phase.

As detailed in the Department’s Environment and Heritage Impact Assessment (EHIA) Guideline, assessment of environmental impacts (including impacts to fauna) is integrated in the Department’s Program and Project Management Framework (PPMF). The PPMF describes how the Department should manage the development of programs and projects. It provides guidance on the key activities, minimum deliverables, decisions, and approvals within each phase of the Project lifecycle. These stages are outlined in Table 2-1 along with the expected level of fauna assessment for each phase.

**Table 2-1 Summary of PPMF Stages and Associated Level of Vegetation Assessment**

PPMF Stage	Description	Level of Fauna Assessment
Initialisation	Building the foundation for the program or project through establishing the need, engaging the team, and identifying and assessing options.	N/A
Proving	Proving the option identified in the initialisation phase is suitable and ensuring the way forward is achievable.	Preliminary Fauna Impact Assessment Refer to Section 2.1.1
Pre-Delivery	Firming up the scope and approach for delivery, identifying and addressing any remaining information gaps and ambiguities, and ensuring commitment to delivery of a project or program prior to going to market.	Detailed Fauna Impact Assessment which may be supported by Fauna Survey, Underwater Noise Assessment and/ or EPBC Self-Assessment Refer to Section 2.1.2
Procurement	Delivery strategy is implemented and the delivery is put to the market for tender. Final preparation to ensure readiness for delivery	N/A
Delivery	Asset is constructed by the delivery contractor, handed over and put into operation	Detailed Fauna Impact Assessment which may be supported by Fauna Survey, Underwater Noise Assessment and/ or EPBC Self-Assessment Refer to Section 2.1.2

The process followed in the Proving Phase, where the scope of a project is undefined or there may be a range of alignment/location options to be assessed, will differ to the Pre-delivery or Delivery Phase where the scope is defined and/or a preferred design and construction methodology is known. The progression of fauna impact assessment will ensure that impacts are identified and minimised as part of project works.

### 2.1 Key Considerations During Project Planning and EHIA

Generally, a preliminary fauna impact assessment should be undertaken during the Proving Phase and a detailed fauna impact assessment should be undertaken during the Pre-Delivery/Procurement/Delivery Phase when the project has a preferred design and is at a level that is generally representative of the final design.

Once a preferred design has been selected, the detailed fauna impact assessment should be utilised to determine if further investigation is required as well as to inform construction methodologies and minimise impacts to fauna.

The focus of fauna impact assessments should be on species listed under the EPBC Act and the NPW Act. The assessment should also consider native fauna of interest with particular commentary provided for any native fauna for which there is key stakeholder interest.

### 2.1.1 Proving Phase

The preliminary fauna impact assessment should identify potential impact minimisation options influencing planning and design decisions (e.g. via informing the Multi-Criteria Analysis process). To facilitate this objective, a preliminary fauna assessment would generally involve a desktop review of existing fauna records relevant to the Project Area and areas in close proximity to the project area, including but not limited to:

- EPBC Act Protected Matters Search Tool (PMST);
- Biological Database of South Australia (BDSA);
- NatureMaps (e.g. to identify Railsides or Roadsides Significant Sites, mapped key habitats, mapped important fauna colonies, presence of native vegetation, proximity to conservation areas); and
- If there is limited data for a site, refer to Atlas of Living Australia (ALA).

The assessment should involve a search of relevant databases to identify threatened fauna species and habitat within the Project Area. Identified species and habitat should then be reviewed to determine the likelihood of occurrence within Project Area. The following is noted:

- The high level likelihood of occurrence assessment is to be based on the available information and with consideration given to the size/phase of the project. Reporting of the assessment should justify the criteria used to draw conclusions (for example, known, likely, possible/may occur and unlikely to occur). The level of detail presented for the assessment should be relevant to project phase and budget/size of proposed impact; and
- The assessment should consider aligning with principles of Native Vegetation Council (NVC) assessment requirement if there is potential for vegetation clearance (for example, focus on the Biological Database of South Australia [BDBSA] records within 5 km or 50 km depending on the Landscape Management Region and utilise the date of the record and spatial reliability to interpret the likelihood of occurrence).

The preliminary fauna impact assessment shall identify key features in relation to the project area including:

- high value fauna habitat;
- ecologically sensitive areas;
- fauna habitat that is protected under Commonwealth or State legislation;
- environmental areas of special significance (e.g. seasonal habitats, wetlands, proximity to conservation areas /vegetation heritage agreements);
- Roadsides and Railsides Significant Sites (relevant to fauna).

The preliminary fauna impact assessment will:

- identify the need to undertake a detailed fauna impact assessment based on a qualitative interpretation of risk to fauna species (i.e. based on the outcomes of the likelihood assessment and/or any site inspection);
- identify the need to undertake a dedicated fauna survey or inspection;
- identify options to avoid or minimise impacts to fauna and/or fauna habitat with reference to Section 3.1;
- consider the implications of cumulative impacts;
- inform the qualitative risk assessment process detailed in Austroads (2021) Guide to Road Design Part 6 and/or project options development/assessment;
- identify if and what other information may be required in this or subsequent phases;
- identify if the project works have the potential to have a significant impact on Matters of National Environmental Significance (MNES) under the EPBC Act (i.e. trigger a referral under the EPBC Act) and provide recommendation regarding how this could be mitigated; and
- determine the recommended approval pathway (if applicable) with reference to timing implications.

In the event that a vegetation survey is undertaken as part of this stage, it is suggested that it is more efficient to undertake an assessment of the actual presence of fauna and/or fauna habitat should be undertaken as part of such survey. Vegetation surveys are to be undertaken in accordance with Department's Vegetation Survey Guidelines which includes provision for the assessment of fauna. The



outcome of the preliminary fauna impact assessment may be summarised in the vegetation survey report, EHIA report, planning report and/or the design report.

During the preliminary fauna assessment, the requirement for a detailed fauna impact assessment should be determined following consideration of the factors detailed in Table 2-2. Note that if the project scope changes (i.e. incorporation of additional areas or additional impacts to vegetation are identified) this determination would need to be revised. Project specific conditions (in addition to what is presented in this table) must be considered when determining the need/recommendation to undertake a Fauna Impact Assessment.

**Table 2-2 Determining the need for a detailed fauna impact assessment**

Detailed Fauna Assessment Requirement <sup>1</sup>	Contributing Factors
A Detailed Fauna Impact Assessment is generally not required if:	<p>No vegetation is to be affected by the project works;</p> <p>No vegetation likely to provide preferred or high-value fauna habitat is to be affected (for example urban exotic street trees providing non-core/non-preferred habitat, road verge infested with weed species);</p> <p>No impact to natural drainage lines, watercourses or the marine environment will occur; and/or</p> <p>Impacts to matters of national environmental significance (relative to fauna) are unlikely/negligible (including consideration of above ground and underwater noise).</p>
Depending on the determined qualitative risk, a Detailed Fauna Impact Assessment <sup>2</sup> may be required if:	<p>Vegetation is to be affected by the project works;</p> <p>Vegetation likely to provide preferred or high-value fauna habitat is to be affected by the project works;</p> <p>There is a likely presence of native fauna with a conservation rating;</p> <p>There may be an impact to natural drainage lines, watercourses or the marine environment;</p> <p>There may be impact fauna passage including fragmentation (including further fragmentation) of habitat (terrestrial and aquatic) and fish barriers; and/or</p> <p>There may be impacts to matters of national environmental significance (relative to fauna and including consideration of above ground and underwater noise).</p>

<sup>1</sup> Scenarios are presented here are non-exhaustive. Project specific conditions (in addition to what is presented in this table) must be considered when determining the need/recommendation to undertake a detailed fauna impact assessment.

<sup>2</sup> note that the scale of the fauna impact assessment should be reflective of the scale of the works and the level of impact posed by such works. A detailed fauna impact assessment does not have to include a site visit and can be desktop based.

### 2.1.2 Pre-Delivery/Delivery Phase

Once the detailed project scope and/or the preferred design is known, if there is a need for further investigation, the preliminary fauna impact assessment should be reviewed and updated to become the detailed fauna impact assessment. Where a survey was not conducted as part of the preliminary impact assessment (either standalone or as part of a vegetation survey), a survey may be required at this phase.

The outcomes of a detailed fauna impact assessment shall address the following, as a minimum:

- detail all fauna/fauna habitat that may be impacted, both directly and indirectly, throughout the Project Area during the construction and operation of the project. The fauna/fauna habitat quality, value and legislative status should be clearly identified. Note that where indirect impacts extend beyond the Project Area, this is to also be identified;
- provide options for the avoidance or minimisation of impacts to fauna/fauna habitat through design considerations (example consideration provided in Section 3.1) and/or construction methodologies (including the requirements of any specific management plans);
- provide recommendation to undertake an underwater noise assessment or land based noise assessment;
- considering the outcomes of the assessment of whether a species and/or habitat has the potential to be impacted by project works, provide an assessment to determine if there are likely to be any Significant Impacts on MNES (under the EPBC Act) based on the project design and construction methodology;

- this portion of the assessment may involve a literature review to support the recommendation on the likelihood of occurrence of the species and/or habitat i.e. to gather further information on recorded sightings during previous surveys or studies of information regarding the specific habits and preferred habitat requirements of identified species and considering broad relevance to the Australian Government Department of the Environment (DotE - 2013) Significant Impact criteria;
- this assessment must include the recommendation to complete (or otherwise) a self-assessment under the EPBC Act (note that such assessment would be completed as a separate scope of works/deliverable). A self-assessment would not be required for species identified as unlikely to occur (following likelihood of occurrence assessment);
- identify the need for obtaining external approval to undertake project works; and
- identify protection measures to be adopted during construction in addition to those details in Section 3.2.

Fauna impact assessment and approval processes will be undertaken in accordance with Master Specification Parts PC-ENV1, PC-ENV2 and relevant legislation. Where possible, the detailed fauna impact assessment should be incorporated into the vegetation survey or impact assessment for the project (if this is being undertaken) with the outcomes also summarised in the EHIA report, planning report and/or the design report. Reporting for a detailed fauna impact assessment should address the following:

- details of the project background and summary of expected construction works and methodology;
- a summary of relevant legislation;
- details of fauna to be impacted, both directly and indirectly, during and following the project works;
- details of the survey methodology, findings and limitations of any field surveys undertaken (if applicable);
- an assessment of the assessment outcomes detailed earlier in this section;
- details of any external approvals required and associated offset;
- details of how impacts have been avoided and or minimised; and
- details of mitigation measures recommended to be implemented during and following the project works.

Where the design and associated construction (including construction areas) impact on natural drainage lines/watercourses/culverts, the consideration of maintaining fish/fauna passage is required. Additionally, where barriers to fish passage exist within the Project Area, opportunity to remove or improve the barrier are to be considered. Refer to Appendix A of this Guideline for further details regarding the maintenance of fish passage.

Liaison may be required with external organisations, such as the Department of Environment and Water (DEW); Landscape Boards SA; SA Museum or local interest groups (e.g. friends of parks groups, field naturalist groups, citizen science programs, universities, known species specific specialists, Birdlife Australia) to seek further clarification on the presence of fauna and/or fauna habitat within the Project Area.

When a fauna inspection is undertaken during a vegetation survey or other site inspection, the inspection should aim to identify direct and indirect evidence of fauna presence within the survey area. For a number of species, the indirect signs can easily be distinguished, however, for some species a high level of knowledge of the species' ecology is required to determine if such species are present. The field inspection (as part of a vegetation survey or other site inspection) would generally not include intensive survey methods such as spotlighting and trapping that may be employed in a dedicated fauna survey, unless otherwise specified under the Contract Documentation or required for seeking approval from relevant authorities.

During the preparation of a detailed fauna impact assessment, the Contractor shall determine the need for a dedicated fauna survey (and the level of survey required) to inform design considerations and construction methodologies and assist in obtaining legislative approvals. The outcomes of the fauna survey should be incorporated into the fauna impact assessment to ensure that potential impacts and associated mitigation measures are well understood.

## 2.2 Fauna Survey

A Fauna survey, involving a ground based survey, should be considered when:

- there is a high likelihood of significant fauna or fauna habitat being affected by project works;

- the full impact of the project on fauna needs to be determined or quantified;
- remediation/mitigation measures need to be determined; and/or
- a survey is required to support approval/referral documentation.

Fauna surveys must be undertaken by suitably qualified persons with experience identifying the expected fauna and should be completed in accordance with the Department of Environment and Heritage (2000) Guidelines for Vertebrate Surveys in South Australia. Permits to undertake such surveys (e.g. DEW Wildlife Ethics Permits and DEW Scientific Research Permits) and associated licences would also need to be valid.

Fauna surveys can be undertaken at different levels, for example:

- a general or baseline survey where all fauna groups (e.g. mammals, reptile, birds, fish and insects) are surveyed, would be required when it is unknown what species are likely to occur in the area or where a number of significant fauna species are likely to occur in the area or where habitat quality indicators (e.g. hollows) are known to be present. This might include high level survey of the site for the presence of general fauna, general fauna habitat and hollows; or
- If it is known that several species from one fauna group occur in the area (e.g. several reptile species) or a single species of conservation significance, then it may warrant the inclusion of a survey that targets that particular fauna species or group. Alternatively, a survey may focus on only on one particular fauna group (e.g. birds) or a particular species (e.g. Black-eared Miner), if there is reason to believe that only this one group or species is likely to be affected and/or there is considerable stakeholder interest or justification to support significant impact 'unlikely' statements in the EPBC self-assessment. This might include general bird survey (observations/call playback), trapping survey for mammals and reptiles (following SA Vertebrate Guidelines) or targeted species specific survey aligning with the Australia Department of Agriculture, Water and the Environment (DAWE) threatened species survey guidelines (for birds, reptiles, bats, frogs, fish, mammals).

A fauna survey should be preceded by a desktop assessment of potential impacts to fauna that would generally include an assessment of a suitable survey method, outcomes of any previous field survey(s), as well as discussion of fauna records and any other relevant information about an area and the fauna species present.

The timing of a survey and techniques used in a survey should be tailored to species relevant to the Project Area and proposed works. The survey report should also include discussion of species that were not found during the field survey but are likely to be present within the area. A field survey may include the use of techniques such as spotlighting, trapping (e.g. Elliott, funnel, pitfall, cage) and/or active searching, scats/tracks, photos, camera trapping. Data analysis will include evaluating the data from the field work as well as existing recent fauna records and information obtained from relevant stakeholders/interest groups.

## 2.3 Assessment against the Department's Underwater Piling and Dredging Noise Guideline

Where project works involve construction within the marine environment, the Department's Underwater Piling and Dredging Noise Guidelines are to be consulted. Consideration of the guidelines will inform the detailed fauna impact assessment as well as support the determination of whether an EPBC Referral will be required for project works.

## 2.4 EPBC Act Self-Assessment and Referral

Under the EPBC Act an action will require approval from the Australian Government Environment Minister (the Minister) if the action has, will have, or is likely to have, a significant impact on a matter of national environmental significance. Where proposed project works may have a significant impact on fauna (or its habitat) that is listed under the EPBC Act a referral under the EPBC Act may be required to determine if the proposed works require approval by the Minister.

Generally a self-assessment is undertaken to determine the need to submit a referral under the EPBC Act for a project. The self-assessment process, as detailed in the DotE Significant Impact guidelines, is to be adopted for any self-assessments undertaken for the Department.

Further assessments and development of mitigation and offset strategies may be required in accordance with the EPBC Act. Refer to EPBC Act policy statements, publications and resources for assessment and referral requirements.

## 3 Fauna Protection

### 3.1 Pre-Delivery and/or Delivery Phase

Following a preliminary fauna impact assessment, where potential impacts to fauna have been identified, the following considerations should be incorporated in options selection and design process to avoid or minimise impacts to fauna (including their habitat and corridors):

- alternative alignments;
- minimising the impact area;
- opportunities to program the works to avoid or minimise activities within a breeding season or migratory season for potentially impacted species;
- opportunities for relocation of fauna prior to construction (on the advice of a suitably qualified ecologist);
- design of waterway crossings, fauna ladders and fish passages to allow fauna and fish movement both during construction (as a temporary measure) and following project completion. Refer to Appendix A of this guideline;
- alterations of design to limit the fragmentation of fauna habitat;
- design of exclusion fencing to separate the fauna from the transport corridor; fauna tunnels/crossings/ladders to allow safe crossing of a transport corridor or to maintain movement and habitat connection during construction (as a temporary measure) and operation; and/or
- design of offset or compensatory habitat (e.g. revegetation, nest boxes, hollow relocation etc.) or habitat corridor connections as part of a project's landscaping.

Where required to be installed, the design and construction of the mitigation measures must be suitable for the target fauna species. Care in design must be taken to ensure that introduced species are not preferentially accessing the mitigation measures in place of the target fauna. Mitigation measures should only be designed by suitably qualified persons and must be documented in project design reports (or similar).

Further information on fauna management can be found in Austroads: Guide to Road Design Part 6B, Roadside Environment (2015).

### 3.2 Delivery Phase

Protection measures to be adopted during construction works are to be informed by the previous investigative work. Such measures are to be clearly documented in the Contractor's Environmental Management Plan (CEMP) for the project.

As a minimum, the following activities must be undertaken during construction works:

- implement all reasonable and practicable measures to minimise disturbance to fauna (including marine mammals and other marine fauna, where applicable) and prevent injury to fauna;
- prior to the removal of vegetation/other activities identified to have the potential to impact fauna, the area to be affected should be checked for fauna species by a suitably qualified person;
- under the supervision of a suitably qualified specialist, relocate any native fauna to a similar habitat if that fauna's habitat will be destroyed by the project works;
- where tree hollows have been identified during tree removals, these must be relocated as per the requirements detailed in PL-LS-C11 and PR-LS-C12;
- these hollows are to be placed on the ground amongst existing vegetation in a location where they do not smother native vegetation or present a hazard to persons or property;
- daily checks of project areas should be undertaken to identify any fauna that are trapped within the Project Area. These animals should be removed or relocated away from the construction area by suitably qualified and experienced persons;
- if any fauna species are trapped or injured on site, Fauna Rescue of SA or the RSPCA should be contacted to provide advice on the relocation of animals or treatment of the injured animals. A local veterinarian may be required to treat injured animals;

- provide fauna ladders and fish passage devices, to enable fauna to pass through or around the construction site (refer to Austroads Guide to Road Design [2021] Part 5: Drainage and Appendix A of this Guideline further information);
- instigate work practices which allow avian and marine fauna that are sensitive to noise to depart without risk of harm;
- any conditions of environmental authorisation relevant to the protection of fauna during project works are to be implemented; and
- as informed by the preceding fauna impact assessment, additional fauna protection measures are to be adopted, as required.

Note that a Permit to Take Protected Animals from the Wild, obtained under the NPW Act is required for the translocation of protected animals.

## 4 Reporting and Deliverables

Unless specified otherwise in Contract Documentation the following reporting applies to each phase of the project. Reporting shall be provided to the Department's Technical Services Environment and Sustainability Unit for review and acceptance.

### 4.1 Proving

During the Proving Phase of a project, fauna impact assessment information may be required for input into an options assessment, the EHA Report and to inform the cost estimation of the project.

#### *Preliminary Fauna Impact Assessment information*

The outcomes of a preliminary fauna impact assessment (refer to the assessment outcomes detailed in Section 2.1.1) and supporting documentation are to be incorporated into the preliminary EHA report. The impact assessment should also be summarised in the planning and/or design reports. Where multiple project options are being assessed and compared, the preliminary fauna impact assessment outcomes are to be reported in a suitable location to inform such option comparisons. Where suitable, the fauna impact assessment could also be reported alongside the vegetation survey and impact assessment (if undertaken for the project).

### 4.2 Pre-Delivery/Delivery

During the Pre-Delivery/Delivery Phase of the project, fauna impact assessment may be required for input into the EHA Report, to inform project design and the approvals pathway for the project.

#### *Detailed Fauna Impact Assessment information*

The outcomes of a detailed fauna impact assessment (refer to the assessment outcomes detailed in Section 2.1.2) including fauna survey (if undertaken) and supporting documentation are to be incorporated into the EHA report. The impact assessment should also be summarised in the planning and/or design reports. Where suitable, the fauna impact assessment could also be reported alongside the vegetation survey and impact assessment (if undertaken for the project).

AND

#### *Fauna Management Plan*

Where identified to be required during a fauna impact assessment, a fauna management plan is to be prepared as either a standalone document or as part of a Contractor's Environmental Management Plan.

The management plan is to include the following information:

- roles and responsibilities;
- legal (and other) requirements;
- target species;
- management strategies;
- process for evaluation and review; and
- emergency procedures.

AND

Fauna corridors (including fish passages) may be installed as part of project works. Details regarding the ongoing maintenance requirements are to be provided during project handover.

*Handover Documentation*

Ongoing environmental management requirements for fauna corridors are to be detailed in project handover documentation. The following details are to be provided:

- type of maintenance works,
- recommended frequency to ensure that the design function is maintained; and
- responsibility, for example the Department, Council or the Department for Environment and Water.

### 4.3 Realisation

During the Realisation Phase, ongoing maintenance of any fauna corridors established for a project will be required in accordance with handover documentation.

## Appendix A - Maintaining Fish Passage and Aquatic Habitat during Design and Construction

### 1. Introduction

Construction work within a watercourse can have significant impacts on fish and fish habitat. This appendix describes a range of issues which should be considered throughout the project lifecycle from Proving to Realisation when considering impacts to native fish passage/habitat and how such impacts should be managed (including engineering controls). This appendix should be read in conjunction with Austroads Guide to Road Design (2021) Part 5: Drainage.

Further information regarding the design of fish passages may be found in the following documents:

- NSW DPI Fisheries (2015) Fishway Design Guidelines;
- NSW DPI Fisheries (2003) Fish passage requirements for waterways crossings;
- Witheridge, G.M. 2002, Fish Passage Requirements at Waterway Crossings – Engineering Guidelines. Catchments & Creeks Pty Ltd, Brisbane;
- DELWP (2017) Guidelines for the design, approvals and construction of fishways;
- DELWP (2017) Monitoring the performance of fishways and fish passage works;
- DELWP (2017) Guidelines for fish passage at small structures;
- DELWP (2015): Performance, operation and maintenance guidelines for fishways and fish passage works.

Transport infrastructure and watercourse crossings have the potential to impact both directly and indirectly on fish and fish habitat during construction and subsequent use. Although many waterways are degraded and many species of aquatic flora and fauna are under stress due to a range of factors, significant steps are being undertaken to restore and enhance waterways by Landscape Boards, Councils and community groups.

Where a Project Area interfaces with aquatic environments or involves the design of watercourse crossings such as bridges, causeways and culverts, consideration needs to be given to the impact of these works on aquatic fauna.

### 2. Potential Impacts on Fish Passage and Aquatic Habitat

Transport infrastructure and in-stream (including temporary) works required for the construction of bridges, causeways and culverts can impact on aquatic fauna in a number of ways.

#### 2.1. Barriers to Fish Passage

Fish passage can be impeded or prevented by a crossing structure in the following ways:

- Changes to water velocity or turbulence - crossings may alter the natural velocity and local hydraulics of a stream by changing the cross-sectional area and invert level of the watercourse. Increased velocity can create a barrier to upstream migration of fish as they may be unable to swim upstream against the increased flow velocity; or
- Physical barrier – a drop between the culvert and the stream bed or construction of an embankment across a drainage or flood channel can restrict the movement of fish. It also concentrates fish, making them susceptible to predation and disease.

#### 2.2. Water Pollution

Pollution from a range of sources may affect aquatic fauna:

- Sedimentation – many freshwater fish species lay eggs on the river bed in areas which provide some shelter from water flow and predators. Sedimentation can smother the eggs and other aquatic flora and fauna, and infilling of gravel beds and deep pools can reduce areas for shelter;
- Turbidity – turbid water harms fish by irritating their gills;
- Nutrients – nutrient rich stormwater/irrigation run off can cause eutrophication in waterways resulting in algal blooms which can create toxic environment for aquatic fauna, potentially leading to fish kills;



- Organic matter – organic matter which enters waterways from leaf litter, wastes, general litter and algal blooms is broken down by bacteria and in the process uses up the dissolved oxygen in the water. Low levels of dissolved oxygen may lead to sediment desorption of phosphorous and metals and can lead to stressing of the aquatic community and fish kills;
- Acid sulphate soils – fish kills and fish diseases can occur through disturbance and release of acidic runoff from these soils; or
- Contaminants (hydrocarbons, metals, pesticides etc.) – pollutants in road runoff can reduce water quality and impact upon the health of aquatic organisms.

## 2.3. Loss or Changes to Fish Habitat

Losses or changes to fish habitat can be caused by the following:

- Alterations to stream alignments and hydrology can impact on fish habitat. Riparian vegetation provides shelter to aquatic fauna from flow and sunlight and should be maintained or restored. Stream bed irregularities and snags can provide important spawning grounds for native fish;
- In estuarine areas mangroves and seagrasses provide important nursery areas for juvenile fish species and are an important part of the food chain.

Project impacts on aquatic habitat shall be avoided, where possible. If unavoidable, recommendation for associated habitat rehabilitation or environmental compensation to mitigate the impact should be made.

## 2.4. Introduction or Proliferation of Pest Species

Changes to fish habitat may lead to the introduction or proliferation of pest species due to changes in flow conditions, physical attributes and chemical inputs. Care should be taken to ensure that conditions that favour pest species are not introduced.

# 3. Design of Structures

## 3.1. Watercourse Width and Velocity

To retain fish passage, the natural stream width should be maintained to minimise increases in water velocity at crossings. Natural tidal flows in coastal areas and inundation of estuarine areas should also be maintained. In some cases it may be appropriate to design culverts of three differing flow capacities:

- for fish passage during low flows;
- for fish passage during high flows; and
- able to cope with flood events.

It is important to take into account the swimming speeds of the native fish species in the watercourse and the individual characteristics of the structure such as flow conditions and stream environment when designing modifications or structures.

Further details regarding the design of aquatic fauna pathways is presented in Austroads (2021) Guide to Road Design Part 5: Drainage – General and Hydrology Considerations.

## 3.2. Invert Level of the Crossing

Vertical or steep drops should be avoided as most native fish are unable to leap over even small structures. The invert levels of culverts should reflect the natural level of the stream bed, so that water velocities, both through and immediately downstream of the culvert are the same as the natural flow rates upstream of the crossing.

## 3.3. Managing a Drop or Apron

If a drop needs to be created, a resting places for fish on the downstream apron or a fish ladder should be considered. Providing resting places for fish on the downstream apron is critical to successful fish passage. Fish must be able to pause in high velocity water as they approach the weir, or any obstruction, so that their passage can occur in a stepwise fashion. This is important when fish are using burst speeds, which can only be maintained for a few seconds.

Wooden baffles, boulders or large rocks can be successfully added to the downstream apron of a weir to provide resting areas. The order of placement of obstruction objects is important and an ordered pattern of staggered rows suited to the size of fish in the waterway, should be used. If using rocks they should have crevices under them to provide access for fish to hide and rest. The placement of jutting, irregular shaped

and sized rocks immediately upstream and downstream of the culvert and on the apron of a structure or weir provides shelter and rest areas for fish entering and exiting the culvert. Figure A-1 and Figure A-2 show some examples of these structures.



Figure A-1 Roughened surface provides a fish ladder in Tookyerta Creek



Figure A-2 Avoidance of steep drop during low flows



Figure A-3 Fish ladder in culvert traversing Margaret Creek along the Oodnadatta Track

### 3.4. Improving Habitat within a Culvert

There are a number of options to maintaining natural substrate or stream bed conditions within culverts and pipes:

- bottomless culverts/pipes ensure minimal disturbance to the stream bed;
- the base of the pipe/culvert is set into, rather than on the stream bed.
- natural sediments from the site (e.g. mud, sand and gravel) can be placed on the bottom of the culvert which can then provide continuous stream bed habitat.
- the top surface of the base of the culvert/pipe can be roughened at the concrete pouring stage to create small depressions – these will then allow natural sediments to be trapped in the base of the culvert/pipe creating a more natural substrate for fish or a fish passage can be built into the culvert base.
- pipes/culverts create a foreign environment which may be difficult for fish to navigate and may even inhibit fish movement because of the dark conditions. In these situations consideration should be given to minimising the width of the structure or incorporating grates or sky lights in the top of the culvert/pipe.

### 3.5. Fords

Where possible fords should be located in areas of minimal river gradient. The gradient should be even over the entire section. Vertical or steep drops should be avoided by use of the above techniques.