



8218 Cast Insitu and Precast Fishway

REVISED 10/09/2025

8218.1 Introduction

This supplementary specification applies only to the design and installation of cast insitu fishways using natural rock ramps, precast cone type ramps, precast trapezoidal and vertical slot baffles, and precast pool and weir ladders. It does not cover specialised fishways such as lifts or locks, culvert retrofitting of baffle type attachments, or the demolition of existing fishway barriers.

The purpose of this specification is to outline MRC’s minimum requirements for the design, installation, and maintenance of fishways.

8218.1.1 Definition of Terms

This section describes any term which are specific to this specification or requires clarification due to an ambiguous understanding.

The terms used in this Technical Specification shall be as defined in Clause 2 of MRTS01 *Introduction to Technical Specifications*. Additional terms used in this Technical Specification are defined in the Table below.

Term	Definition
Fishway Ecologist	Means a person or entity that is suitably qualified and experienced in fish passage biology or ecology and fish passage design and construction, understands Queensland's legislative requirements for fish passage structures, and also implements monitoring programs that ensure that the fish passage provisions are functioning as designed.
Cast Insitu Fishway	For the purpose of this specification deemed to include rock ramps, cast insitu components and precast components installed on site to form a fishway. Does not cover Fish lifts or locks.
Dry Commissioning	Survey and measure all constructed dimensions of the fishway comply with the design drawings are within set tolerances.
Wet Commissioning	Monitor and ensure that specific fishway hydraulic variables are within design criteria ranges including total headloss, baffle/cell headloss, flow velocities (e.g. at slot <i>vena contracta</i> and within pools), turbulence and fishway entrance attraction conditions.
Resurvey	Taken to mean both biological/ecological survey of aquatic operations of the fishway, and the physical detailed survey of the fishway structure.

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8218.2 Referenced Documents

This supplementary specification shall be read in conjunction with the following:

- MRS01 “Introduction to Specifications”;
- MRTS01 “Introduction to Technical Specifications”;
- MRS50 and MRTS50 “Specific Quality System Requirements”
- MRTS78A “Fabrication of Structural Stainless Steelwork”
- AS5100.5 “Bridge Design - Concrete”
- Catchment Solutions “Fishway Inspection and Maintenance Manual”
- James Cook University “Culvert Planning and Design Guidelines part A-1”
- Arthur Rylah Institute for Environmental Research Technical Report Series Number 274 – “Guidelines for the design, approval and construction of fishways”;
- Arthur Rylah Institute for Environmental Research Technical Report Series Number 262 – “Performance, operation and maintenance guidelines for fishways and fish passage works”;
- Qld Government – “Accepted development requirements for operational work that is constructing or raising waterway barrier works”;
- The project Drawings; and
- Manufacturer’s specifications.

8218.3 Description of Work Items

Work items incorporated by this supplementary specification are identified in Sections 8218.5, 8218.6, and 8218.7 with individual activities/tasks for measurement and payment sourced from the Bill of Quantities and listed in MRC Supplementary Specification Annexure 8218_1 Cast Insitu Fishway Section 1

8218.4 Quality Systems Requirements

8218.4.1 Std Test Methods (Testing Regime)



The following minimum testing regime applies to this specification:

- Post construction flows – depth, quantity, and velocity monitoring throughout the installed fishway in compliance with the required frequency and timing,
- Detailed survey of completed fishway, peripheral areas associated with the fishway structure and alterations within the water course and banks, and components both natural and constructed,
- Civil works activities associated with the floor of excavation, bed preparation, concrete pours, and backfilling shall be tested as per the relevant MRTS specification MRTS04, and MRTS70 shall apply unless otherwise approved by the Fishway Ecologist and Superintendent.

The following fishway inspection/resurvey frequency shall apply post construction during and after the “On Maintenance” period;

<p>Routine Operational Monitoring;</p>	<ul style="list-style-type: none"> • Every 3 years: Review of gate operations, discharge data, and hydraulic relationships (e.g. headwater/tailwater levels). • Seasonal checks: Especially during migration seasons of the various aquatic species, to ensure passage conditions are optimal.
<p>Post-Flood Inspections</p>	<ul style="list-style-type: none"> • Immediately after flood events: To assess structural integrity, sediment shifts, and debris accumulation
<p>Biological Monitoring</p>	<ul style="list-style-type: none"> • Two migration seasons post-construction: Required during commissioning to verify biological effectiveness. • Ongoing biological assessments: May be scheduled annually or biannually depending on fishway performance and ecological priorities.
<p>Fishway Re-Survey</p>	<p>As needed, could be triggered by operational anomalies to structural and hydraulic functions, or poor biological performance. This includes:</p> <ul style="list-style-type: none"> • Carrying out an asset structure detailed survey verifying the fishway layout. • Carry out reassessment of internal hydrodynamics. • Verifying compliance with design criteria and post construction “As Constructed” documentation.

Triggers which may also require consideration of additional inspection/resurvey;

- Damage to the physical structures of the fishway, including rock ramps.
- Non-compliance with State Monitoring, Evaluation, Reporting (MER) requirements.
- Changes in upstream/downstream habitat or flow regimes.
- Community or stakeholder concerns.
- New research or tagging data indicating poor passage success



8218.4.2 Hold Points, Witness Points and Milestones

The following table represents the minimum inspection requirements for this specification;

Activity	Inspection Type	When	Clause Reference
PRELIMINARY			8218.5
Construction Procedure and other submissions as required by Clause 8218.5	Milestone	4 Weeks prior to works commencing	8218.5
Test result submission (as required)	Hold Point	Prior to proceeding with installation / construction of fishway retrofitting	8218.5.8
CONSTRUCTION			8218.6.0
Site inspection of all delivered materials, fittings, and components	Hold Point	At time of delivery to site	8218.6.2.1
Prestart site meeting	Hold Point	Prior to site works commencing	8218.6.2.2
Carry out temporary works under ADR approval	Hold Point	Prior to preparation of and installation of retrofitting components to culvert floor/walls	8218.6.2.3
Delineation of "No Go" zones on site outside of ADR approval.	Witness Point	Prior to works commencing	8218.6.2.3
Contractors installation process included in works procedure, and submitted 4 weeks prior to works commencing	Milestone	Prior to site works commencing	8218.6.5
Rock Ramp Fishway			8218.6.5.1
Mark out fishway rock ramp for approval to proceed	Hold Point	At completion of excavation prior to commencing installation of rock ramp	8218.6.5.1
Installation of geofabric within each zone and at bed of rock ramp structures	Witness Point	Prior to commencing rock placement within fishway structure	8218.6.5.1
Placement of rock, and construction installation as required by design drawings	Witness Point	During installation under the supervision of the Fishway Ecologist	8218.6.5.1
Monitoring and reviewing of fishway rock ramp	Witness Point	During construction by the Fishway Ecologist	8218.6.5.1
Endorsement of Fishway rock placement within fishway	Hold Point	Prior to pouring concrete to rock ramp locking in all placed rock (as required)	8218.6.5.1
Concrete type and placement, shaping, grade, and thickness verified	Hold Point	During pouring and including concrete slump and compressive strength testing	8218.6.5.1
Precast Fishway Componentry			8218.6.5.2
Installation of precast fishway components as required by design drawings	Witness Point	During installation of precast fishway components	8218.6.5.2
Installation of fishway to design drawings, where required seek advice and remediate works	Hold Point	During installation of fishway components	8218.6.5.2
Alterations to fishway passage to suit site conditions	Hold Point	During installation of approved fishway and approved by Fishway Ecologist	8218.6.5.2



Collection of "As Constructed" details, including detailed survey, to form the basis of certification of the fishway	Hold Point	During and at completion of installation of fishway components	8218.6.5.3
Commissioning of fishway	Witness Point	At and during removal of temporary works	8218.6.6
During commissioning monitoring fishway for effectiveness, granting final approval	Hold Point	During wet commissioning, and at the completion of any required minor alterations	8218.6.6
Ongoing survey and operations inspections by Fish Ecologist, and submission of reports and findings	Hold Point	During "On Maintenance" period	8218.6.87
Revision and submission of Operation and Maintenance Management Plan	Hold Point	At completion of all fishway installation activities	8218.6.7
Clean up and restore site to preconstruction condition or ADR requirements	Hold Point	At completion of all fishway installation activities	8218.6.8
POST CONSTRUCTION			8218.7
As-Constructed documentation	Hold Point	4 weeks prior to practical completion being requested.	8218.7.1
Site ESC Measures in place	Hold Point	Ongoing and at end of project until approval to remove	8218.7.3

8218.4.3 Construction Tolerances

Construction tolerances shall comply with the ADR, and the design drawings unless otherwise stated in Annexure 8218_1 Cast Insitu and Precast Fishway Clause 2 or as approved by the Superintendent the following construction tolerances shall apply as to this Specification;

Design item	Vertical-slot & cone tolerance	Rock-ramp tolerance
Invert of hydraulic control point	±2 mm from design.	±5 mm from design.
Variation in slot width	±1.5% for adjacent baffles.	Match cross-sectional area of flow pathways throughout the fishway.
	±3% along full length of fishway.	
Hydraulic head loss	±5% from design per baffle.	No head loss is to exceed 20% of design (e.g. no head loss > 120 mm in a fishway designed for 100 mm).
Gridmesh	Meets required standard.	
Baffle and rock angle	Angle of water jet conforms to design standard without water jet turning directly downward, creating 'carryover' water velocity at next slot.	In lateral-ridge-rock fishways, the rocks in adjacent pools should <i>not</i> be aligned to limit carryover water velocity.



8218.5 Preliminary

8218.5.1 MRC, Fishway Ecologist, and Contractors Responsibilities

The Contractor shall still be responsible for site WH&S, Traffic Management, Quality, and Environmental requirements.

The fishway project involves multiple phases and multiple input from varying stakeholders from inception, through design, and finally construction. The following shall be used to separate the phases and the responsibilities of the main stakeholders unless otherwise agreed to at any of the Project Meetings or the Prestart Meeting;

Mackay Regional Council (or Engaged Engineering Consultant).

- a. Inception of project;
 - Scope project and engage Engineering Consultant (as required) for design,
 - Designer to engage specialist Fishway Ecologist,
- b. Design Drawings and Documentation;
 - Carry out consultation with stakeholders,
 - Engage MRC survey team to carry out detailed survey based on Fishway Ecologists requirement,
 - Compile and endorse design and collate design documents and reports,
 - Approve design documentation submissions,
- c. Construction
 - Tender out works for the fishway as required by the design drawings and documentation,
 - Carry out inspections of civil works performed on site,
- d. Monitoring and Maintenance Post Construction
 - In conjunction with Fishway Ecologist carry out defect liability inspections.
 - Notify asset owner/s to enable inspections and maintenance to be carried out in accordance with the Operational & Maintenance (O&M) Management Plan as required for the fishway to operate as designed post defects liability period.

Fishway Ecologist.

- a) Inception of project;
 - Liaise with Designer over engagement for investigation and design requirements,
- b) Design Drawings and Documentation;
 - In conjunction with Designer carry out consultation with stakeholders,
 - Carry out site inspection/s and investigations to enable design of fishway,
 - Compile and endorse reports and submit to Designer for inclusion in project documentation,
 - Review and approve design drawings and documents,
 - Draft and endorse an operational & Maintenance (O&M) Management Plan for the fishway, including inspection regime (frequency) and component/s to be inspected each time, and where required comply with all conditions of the approved ADR.
- c) Construction
 - Ensure all permits are in place and works have approval to proceed,
 - Procure (select) materials for the fishway construction,



- Supervise all works on site during construction of fishway,
 - Ensure all works comply with the design drawings and documentation,
 - Carry out minor amendments to the works scope as site conditions dictate,
 - Endorse “As Constructed” drawings and documentation for Contractors submission to MRC,
- d) Monitoring and Maintenance Post Construction
- In conjunction with MRC Superintendent inspect fishway for defects during defects liability period, notifying MRC and Contractor of requirements to repair.
 - Monitor fishway for operation as intended.

Contractor

- a) Inception of project;
- Nil
- b) Design Drawings and Documentation;
- Nil
- c) Construction
- Tender for works, ensuring works requirements and scope are clear and understood,
 - Submit all required documentation prior to commencing site works or holding the prestart meeting
 - Engage Fishway Ecologist to supervise all site works and to ensure all permits are in place to carry out works,
 - Procure (purchase) materials and supply to site,
 - Engage Engineering Consultant (as required) to carry out inspections and any endorsement of civil and structural works carried out on site,
 - Carry out site works as directed by the Fishway Ecologist and/or the Engineering Consultant,
 - Survey and document “As Constructed” works as completed,
 - Arrange and carry out inspections of site civil works (in conjunction with others) as required,
 - Ensure submission of “As Constructed” drawings and documentation in accordance with MRC Supplementary Specification 8919,
- d) Monitoring and Maintenance Post Construction
- Carry out all requirements of the Operations and Maintenance manual for the 12 months of the “On Maintenance” period.
 - During “On Maintenance” period repair all identified defects to construction works as instructed by Fishway Ecologist.

8218.5.2 Documentation Submission

The Contractor is to submit the following documentation 4 weeks prior to commencing work or a prestart is conducted:

- Evidence of procurement of Fishway Ecologist to supervise works, approve and certify all required submitted documentation;
- Documentation verifying Relevant Accepted Development, Tidal Works, or Operational Works application and approvals have been granted;
- Listing of all construction documentation verifying version and date control of design drawings, design reports, and other documents as needed to carry out the fishway works;



- Material components certification for use within a watercourse;
- Works procedure/s for all site works;
- Fishway Ecologist endorsed Operation and Maintenance Management Plan of fishway;
- Workplace Health and Safety (WHS) Plan including Work Method Statements (WMS);
- Contractors personnel experience, qualification, skills and training (updated 10 days prior to undertaking work on site);
- Programme for the works including projected timeframes;
- Environmental Management Plan;
- Erosion and Sediment Control Plan (as required for site/s);
- Traffic Management Plan and Traffic Guidance Scheme (TGS), as required;
- Quality Plan detailing requirements of 8218.4;

Other preliminary requirements unique to the project will be listed in the MRC Supplementary Specification Annexure 8218_1 Cast Insitu Fishway.

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8218.5.3 Fishway Design

The fishway design shall initially involve identification and engagement of stakeholders and ownership of the structures, this is important for future maintenance of the fishway and it's structure/s.

Each fishway is unique, the fishway objectives should guide the design process through the local fish ecology and site hydrology of the site. These include but are not limited to the target species, turbulence and velocity, including the ability of the fish species to negotiate the hydraulic conditions of the design.

8218.5.3.1 Fishway Design Report

The design report shall consider the following;

1. Biological and Ecological Considerations

- **Target species:** Understand the swimming abilities, behaviour, and migration patterns of local fish species.
- **Life stages:** Design must accommodate juveniles and adults, which may have different swimming capabilities.
- **Seasonality:** Migration timing affects flow requirements and operational schedules.
- **Biodiversity:** Ensure passage for a wide range of species, not just strong swimmers.

2. Hydraulic Design

- **Water velocity:** Must be within the swimming capabilities of target species.
- **Turbulence and flow patterns:** Should guide fish effectively without causing disorientation.
- **Depth and resting areas:** Provide adequate depth and resting zones to prevent exhaustion.
- **Attraction flow:** Ensure fish can locate the entrance easily through strategic flow placement, proper orientation of fishway entrance to stream flow..

3. Structural and Site Considerations

- **Type of fishway:** Choose appropriate design (e.g., vertical slot, rock ramp, Denil, fish lift) based on site and species.



- **Topography and geology:** Influence constructability and stability.
- **Sediment and debris management:** Prevent clogging and maintain functionality.
- **Integration with existing infrastructure:** Consider dams, weirs, and road crossings (causeways, culverts, bridges).

4. Operational and Maintenance Factors

- **Accessibility:** Design for easy inspection and maintenance.
- **Durability:** Use materials suited to local environmental conditions.
- **Monitoring:** Include provisions for assessing fish passage success.
- **Adaptability:** Allow for future modifications based on performance data.

5. Regulatory and Stakeholder Engagement

- **Permits and approvals:** Comply with environmental regulations.
- **Community and Indigenous consultation:** Incorporate local knowledge and values.
- **Budget and funding:** Balance ecological goals with financial constraints.

Prior to design drawings being finalised the above items shall be established, and any other limiting factors identified and included in the design report. This shall determine the project viability and guide the concept design to the type of fishway structure best suited to meet the objectives of the fishway passage.

The concept design and design report shall be submitted for approval by the Superintendent, Fish Ecologist, and legislative agencies.

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8218.5.3.2 Design Inclusions

The final fishway design shall include the following documents which shall be endorsed by the appropriately qualified personnel responsible for the structural, civil, and site works:

- Certified and endorsed design drawings detailing requirements of design report;
- Detailed certified report addressing Clause 8218.5.3.1, and other factors as identified;
- Certification the fishway will meet requirements of codes and regulatory agencies having jurisdiction.

8218.5.3.3 Design Plan Requirements

Submission for approval of the design drawings for the Cast Insitu Fishway shall be in the format of MRC Document D20, address all issues as noted in Clause 8218.5.3.1 and 8218.5.3.2, those conditioned by legislative agencies, and those detailed in MRC Supplementary Specification Annexure 8218_1.

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8218.5.4 Insitu Fishway

The requirement to install insitu fishways shall be considered as an alternative where the head drop/loss at entrance (outlet of culvert/weir) is significant and cannot be controlled by retrofitting to existing waterway barriers, and requires a graded structure to manage water velocities, depth of water, pool resting areas, and controlling the head drop height for optimal aquatic fish passage.

The preferred option is in stream natural rock ramps, however where the headloss cannot be designed into a rock ramp alternate precast components shall be incorporated as part of the design.

8218.5.5 Materials



Materials which contribute to the release of microplastics into the environment shall **not** be approved or utilised as an acceptable component, these include but not limited to such plastic types as Polyethylene (PE), polypropylene (PP), polystyrene (PS), polyethylene terephthalate (PET), polyvinyl chloride (PVC), and polyamide (PA/Nylon).

The use of recycled rubber products shall also **not** be approved due to the chemical leaching into the watercourse. Their use should be carefully evaluated, alternative materials shall be considered.

All materials proposed to be used on site shall be approved by the site Fishway Ecologist and be compliant with the fishway design drawings, documentation, and reports. Where the construction involves rock the contractor shall ensure a Fishway Ecologist selects all materials to be utilised in the construction of the fishway.

Precast components shall be as required by the design drawings, the Contractor shall procure and supply to site all components to enable the insitu placement and construction of the fishway. The Contractor in conjunction with the Fishway Ecologist and MRC Superintendent shall inspect all materials delivered to site at delivery.

Procurement and supply of all materials to site is the responsibility of the Contractor at their cost, where items are Principal supplied the nominated storage site shall be obtained from MRC Supplementary Specification Annexure 8218_1 Cast Insitu Fishway Section 3 and shall be the point of supply.

Concrete, grout, sealants, membranes, and reinforcing steel shall comply with the relevant MRTS Specification or Australian Standard as listed in 8218.2 as required by the design drawings and documents and submit its MSDS and certification to being natural and for use in watercourses.

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8218.5.6 Handling and Storage of Material, Plant, and Equipment on Site

Materials and components must be stored in accordance with the manufacturer's requirements and at a location on site above the high bank of the water course. The location shall be agreed to at the prestart meeting.

Natural rock shall be stockpiled so as to be easily accessed by plant carrying out the construction works, unless otherwise approved by the Fishway Ecologist.

All materials and components shall be brought to site clearly labelled with the appropriate manufacturer's name, product type, reference number and batch number, and labelled to correspond to the Construction Drawings location placement. Upon delivery materials shall be inspected with damaged items and components returned to the manufacturer.

8218.5.7 Personnel

The fishway project shall be controlled by a Fishway Ecologist, the Contractor shall ensure where assessment against the SDAP code the requirement for supervision of fish passage component design and construction requirements are complied with, the person or entity must have specific qualifications and experience in the following areas:

1. **Fish Passage Biology:** This includes understanding the biological needs of fish species, their migration patterns, and how different fishways impact their movement. Typically, this knowledge is gained through formal education in fisheries biology or ecology
2. **Fish Passage Design:** Expertise in designing fishways that facilitate the movement of fish through barriers. This involves knowledge of hydraulic engineering, environmental science, and specific design principles for fish passage structures



3. **Construction Experience:** Practical experience in the construction of fish passage structures, ensuring that designs are implemented correctly and effectively. This often includes hands-on experience with various types of fishways, such as rock ramps, vertical slots, and cone fishways
4. **Legislative Compliance:** Familiarity with Queensland's legislative requirements for fish passage structures. This ensures that all constructions comply with state regulations and guidelines

Professionals in this field often have a combination of academic qualifications, such as degrees in environmental science, fisheries biology, or civil engineering, along with practical experience in fish passage projects

Personnel, sub-contractors and suppliers utilised in the installation of fishways shall have the skills, capacity, and experience to construct these types of structures, i.e. excavator operator adept at the placing of rock to exact location, alignment, and level. The Contractor shall provide documented evidence for the Superintendent's approval to demonstrate the experience, qualification, skills and training of proposed personnel, sub-contractors, and suppliers. This shall also include the qualifications of all testing agencies proposed to be engaged.

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Other personnel besides the Fishway Ecologist required to carry out inspections of the fishway shall have the knowledge and experience to perform the required asset inspection and/or ecological/biological survey/s, the following are details of such requirements;

- a. Technical and Operational Knowledge of;
 - Fishway design and hydraulics, including head differentials, water velocity, and turbulence.
 - Operation and Maintenance (O&M) Manuals for the specific fishway/s.
 - Hydraulic monitoring techniques, such as measuring water levels and flow conditions.
- b. Biological Expertise;
 - For understanding of native migratory fish species and their behaviour.
 - With the ability to conduct biological assessments, including.
 - To carry out Fishway trapping to assess species passage.
 - To perform PIT tagging (Passive Integrated Transponder) for tracking fish movement.
 - With knowledge of fish migration timing and environmental cues.
- c. Regulatory and Ethical Compliance;
 - Understanding of and compliance with the Fisheries Management Act 1994 (Qld).
 - Holding appropriate permits and animal ethics approvals for handling fish.
 - Adhering to Monitoring, Evaluation, and Reporting (MER) requirements.
- d. Training and Certification

While the above requirements do not specify exact certifications, relevant qualifications may include:

- Environmental science, aquatic ecology, or fisheries biology degrees.
- Training in fishway operation and maintenance, such as the unit NWPCAD016 – Operate and maintain fishways
- Experience with data acquisition and reporting for environmental monitoring.

8218.5.8 Council Work Health Safety Contractor Requirements



As a minimum, the Contractor must ensure they and their workers (including all Contractor's sub-contractors etc.) comply with the following work health and safety requirements:

- Undertake Council Contractor and site inductions prior to commencing work.
- Ensure all workers are competent, and provide proof of competencies, licenses, and training on request.
- Have an approved safe system of work (including risk assessment) for the task and ensure the work is completed according to this safe system of work.
- Provide adequate supervision for all high-risk construction tasks.
- All incidents and near misses are to be reported to their Council representative within 60 minutes.
- Participate in Contractor pre-start meetings, safety interactions, site meetings and site inspections.
- Review information provided by Council such as site-specific hazards, risks and interaction issues and implement controls to, so far as reasonably practicable, eliminate, or if that is not possible, mitigate the risk.
- Supply safe plant and equipment with pre-start checks, maintenance/ service records and manufacturer's manual.
- Comply with Council Safety, Drug and Alcohol and Fitness for Work policies.
- Be familiar with applicable site emergency procedures, closest emergency assembly point and sign in and out of site registers where required.
- Compliance with any reasonable direction given by Council relating to work health and safety.

8218.5.9 Safe Systems of Work / Risk Assessment

The Contractor must prepare and submit a safe method of work (risk assessment) and relevant controls prior to commencement of work.

The completed risk assessment is to be provided to the Superintendent for review and approval prior to works commencing. Safe Work Method Statements (SWMS) are required for all high-risk construction activities (e.g.) and Job Safety Analysis (JSA), or similar risk assessments are required for other tasks. The risk assessment (whether SWMS, JSA or other) must be reviewed and signed by the workers prior to undertaking the work.

MILESTONE

8218.5.10 Environmental

8218.5.10.1 General

The Contractor shall remove all rubbish, debris, disused materials etc from the work site immediately. The work site shall be maintained in a clean state at all times. The Contractor shall collect, transport and dispose of the waste to a registered waste facility.

The Contractor shall keep pollution in the vicinity of the works within reasonable minimum limits noting that this clause does not exempt the Contractor from complying with the limits controlled or required by legislation.

8218.5.10.2 Water Supply Protection

It is critical that contaminants from site works are prevented from entering the waterway. The Contractors Environment Management Plan shall nominate the measures to be put in place.

Any such contamination must be cleaned up and legally disposed of at the Contractor's expense at a registered waste facility.

8218.5.10.3 Vegetation Removal Within Waterway and for Access



While vegetation removal within the road reserve is exempt under the Vegetation Management Act the Contractor shall note and take necessary action to meet the requirements of the relevant Accepted Development Requirements (ADR) referenced in relation to both the works to be undertaken and access to the waterway bed level:

- Minimise disturbance to the instream bed and banks,
- If it is necessary to remove vegetation, aim to cut vegetation no lower than ground level and leave the root in the ground to aid in stabilisation. If deep excavation is required during construction the roots may only be removed within the construction footprint area,
- Minimise the area of land disturbed or compacted e.g. construct a work platform above the substrate,
- Ensure the least volume of soil or sediment is disturbed,
- Limit the use and movement of machinery within waterways,
- Use machinery no greater than the capacity required for the purpose,
- Implement sediment and erosion protection measures.

Any works undertaken to facilitate access to the fishway works site shall include full restoration to preconstruction line and level and the surface fully revegetated complying with the requirements of the applicable Accepted Development Requirements.

Similarly, restrictions exist for vegetation removal for maintenance action under the Accepted Development Requirements. The Contractor shall acquaint themselves with the areas to which such works can be undertaken and ensure no works are undertaken outside of such zones.

8218.5.10.4 Permits for Work

The Contractor must ensure applicable permits for the various work activities are completed and approval issued by the statutory body for those works, all requirements for submission, completion, and obtaining permits shall be at the Contractors cost.

The Contractor is responsible for lodgement of all pre and post works notification requirements to the relevant Statutory Agency and shall not proceed until all approvals are provided to the Superintendent.

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8218.5.10.5 Legislative Compliance

Without limiting the Contractor's other obligations, the Contractor must comply with all Acts, Regulations, Standards and Codes of Practice about work health and safety matters that are applicable to the scope of work undertaken or services being provided.

8218.5.11 Provision for Working in and Around Water

The Contractor is to be aware of the following when performing the required works.

8218.5.11.1 Inundation

The structures may be subject to inundation from:

- Increased watercourse flows from rainfall events. The works may need to be secured at all times for this occurrence and work sites evacuated while the increased watercourse levels prevail. The duration and severity of this event would vary with the duration and intensity of the rainfall that occurs, the Fishway Ecologist shall control when works may resume.
- Tidal water inundation in tide-affected locations. This will restrict the available time for the work to be completed and the structure may need to be evacuated in the event of this inundation.
- Standing water in waterways. The Contractor shall be responsible and may need to make provision in their WMS for dewatering work sites subject to inundation from standing water to enable works to proceed.



8218.5.11.2 Electrical Hazard

Working with electrical tools may be restricted when a site is affected by water. There may be low levels of continual water flow in the work site for extended periods of time. The Contractor shall make the necessary arrangements to ensure a safe workplace at all times.

8218.5.11.3 Concrete Works

Freshly placed concrete/mortar are to be protected from inundation events. Formwork and reinforcement are to remain clean. New works shall be cured for a minimum number of hours/days as required by the design drawings or as directed by the Fishway Ecologist or Superintendent.

The Contractor shall make all necessary allowances to cater for inundation events and provide a detailed methodology of mitigation measures in their Work Method Statements (WMS). No reliance shall be placed on the Fishway Ecologist or MRC Superintendent's acceptance of any particular method of mitigation.

MILESTONE

8218.6 Construction

This section lays out the works operations with more detail based on specific requirements of this supplementary specification. Some activities may appear to include items which are stated within other specifications, the purpose is to reinforce the requirements specific to this supplementary specification.

8218.6.1 Works Operations

The Contractor shall, through their works procedures and scheduling, be responsible to carry out the site activities under the Supervision of the engaged Fishway Ecologist. Work operations incorporated in this item are those included in Clause 2.1.5 of MRS01 "Introduction to Standard Specifications" and the following work scope activities and associated sub activities.

8218.6.1.1 Scope of Works

All works shall be carried out as required by the design drawings and documentation in accordance with the approved Accepted Development Requirements, this Supplementary Specification and Annexure 8800_1 Cast Insitu Fishway;

- Procure, supply, and store materials on site as required;
- Carry out Prestart meeting clarifying works scope, supervision channels, and works procedure/s;
- As approved and as required carry out installation and removal of temporary works (coffer dam/bunding/diverting of flows) to enable the fishway structure to be installed.
- Carry out excavation to line and level, backfill (and compact) to structures, including reinstatement of site as required by design drawings and approved Contractors Works Procedure;
- Carry out installation of the fishway structure;
- Commissioning of Fishway;
- Carry out testing of and monitoring of fishway as required;
- Clean site and reinstate to preconstruction condition;
- Collect and submit "As Constructed" documentation.

8218.6.2 General Works Preparation Prior to Fishway Installation

8218.6.2.1 Supplying all Materials;



All materials, plant, and labour required to carry out the works under this Specification is to be procured and supplied by the Contractor, where it has been agreed materials are Principal supplied the designated storage site will be the point of supply for the purposes of this Specification.

Storage of all materials shall be in accordance with Clause 8218.5.6 and the manufacturers requirements at the agreed location/site.

All items shall be inspected at delivery to site prior to use, any items which are damaged are not to be used and are to be returned to the supplier.

HOLD POINT

8218.6.2.2 Pre-Start Site Meeting

Prior to any site works commencing the Contractor shall conduct a prestart site meeting (including site inspection) with the engaged Fishway Ecologist and MRC Superintendent. This meeting shall ensure all requirements and responsibilities for the installation of the fishway can be fully met and allows for assessment and additional required arrangements that may be deemed necessary.

HOLD POINT

8218.6.3 Carry Out Installation of Temporary Works (coffer dam/bunding/diverting of flows)

Where required and approved, temporary works shall be carried out by the Contractor under the guidance of the Fishway Ecologist to isolate the fishway works from the general flows of the water course. This shall be as approved by the Legislative Agencies conditions and the Fishway Ecologist, e.g. coffer dam, bunding, diversion of watercourse. The works shall follow the approved works procedure, all legislative permit and conditions.

HOLD POINT

Any temporary bunding installed during the fishway works shall take into account the relevant time restrictions referred for declared waterway categories by the Legislative Agency conditions.

Similarly, restrictions exist for vegetation removal for maintenance action under the relevant Legislative Agencies approval. The Contractor must acquaint themselves with the areas to which such works can be undertaken and ensure no works are undertaken outside of such zones. Prior to works commencing “no go” zones shall be clearly identified on site and delineated as such.

WITNESS POINT

8218.6.4 Carry Out Excavations, Bed Preparation, and Disposal of Excavated Material

Prior to commencing excavation the fishway site shall be shaped to allow for ease of access to the site works and the individual rock zones set out for approval by the Fish ecologist.

HOLD POINT

Where excavation is required and approved as part of the works procedure, the Contractor shall ensure all services are located prior to excavation commencing. All excavation of material, foundation compliance, and installation of bedding shall be to level, grade, and dimensions as per design drawings and as agreed by the Fishway Ecologist, and as required by legislative requirements. Tolerances, testing, and inspections shall comply with Clause 8218.4.

HOLD POINT

Where the Contractor is required to alter the riverbed downstream of the structure the works shall be carried out under the Supervision of the Fishway Ecologist to ensure the alterations do not affect the attraction ability of the fishway entrance.



Excavated and loose materials shall be removed from the watercourse and disposed of by the Contractor as required by their Environmental Plan or utilised as per Fishway Ecologists instructions. Material stockpiled shall ensure that all Environmental ESC measures are in place and maintained.

WITNESS POINT

8218.6.5 Installation of Fishway Structure

Construction and installation of each type have its own unique requirements. The Contractor must be familiar with the type of fishway proposed and include the installation process in their approved works procedure.

MILESTONE

The installation of the fishway structure shall be carried by the Contractor under the Supervision of the Fishway Ecologist irrespective of the type of fishway structure designed for the specific situation.

The design drawings and documents shall be followed at all times unless site conditions require the Fishway Ecologist to reassess the construction design to ensure optimal operation of the fishway structure, all deviations from the design drawings and documents shall require agreement from the Superintendent prior to deviation from the design.

8218.6.5.1 Rock Ramp Fishway Construction

Rock ramp fishways may be either a natural rock cascade configuration or a pond and ladder cascade type structure, and where designed include concrete base inverts (aprons) between the rock ridges and wall rocks.

At the completion of excavation for the fishway passage and prior to commencing construction the Contractor shall mark out the location of all ridge and cascade rocks as well as the extents of the fishway passage works on the banks of the watercourse. The Fish ecologist shall verify the design.

HOLD POINT

The contractor shall place geofabric as required by the design drawings and as directed by the Fish Ecologist. This shall be along the excavated base as each zone section is placed, and against the upstream side of the ridge rock face.

WITNESS POINT

The construction of the rock ramp fishway shall commence at the lowest point (centre of outflow) and work upstream. The placement and interlocking shall start with the centre of the rock ridge and placement outwards to the stream banks. All ridge rocks and cascade rocks placement shall be interlocked with each other and keyed into the foundation. All rock placement, including apron rock shall be Supervised and directed by the Fish Ecologist in accordance with the design drawings and documents.

WITNESS POINT

The Contractor shall utilise plant and equipment appropriate for the site activities identified, for the task of picking up, lifting, and direct placement of rock without the requirement to shuffle, push, or pull into place rock grabs/rock buckets shall be utilised. The reach of such equipment shall be such the selection of rock from the stockpile to placement can be carried out with minimum movement of the plant.

All rock shall be handpicked by the Fishway Ecologist for the specific point of placement, these shall have been selected from a quarry by the Fishway Ecologist based on the specific rock zone and use within the fishway ramp. The selected rock shall be stockpiled within graded piles on the site adjacent to the structure, and with ease of access to select and place within the structure.

As required the Contractor and Fishway Ecologist shall constantly review all placed rock and zones when adjoining sections are constructed, the Fishway Ecologist may require reconfiguring of the placed rocks to ensure optimal operation of the fishway ramp, especially during low flows.

**WITNESS POINT**

Where in the design drawings concrete is required to be poured into and around the rock ridge, apron, and cascade rocks the Contractor shall obtain the Fishway Ecologist approval to proceed. This shall only occur after an inspection by the Fish Ecologist and the Superintendent and the works are endorsed by the Fish Ecologist.

HOLD POINT

The concrete shall be fibre reinforced concrete with the aggregate and fibre type as required by the design drawings. The shape/form, thickness, grade, and finish of the concrete shall comply with the design drawings, and approved by the Fish Ecologist. The method of placement shall be as directed by the Fishway Ecologist. Testing of the concrete for slump and compressive strength shall be to the requirement of MRTS70.

HOLD POINT**8218.6.5.2 Concrete Fishways (Proprietary Precast Components)**

Concrete fishways are insitu constructed on site from proprietary precast components. These are varied and include such types as, pool and slot, vertical slot, cone, Denil and trapezoidal designs.

The proprietary precast components shall be installed to the design drawings requirements and in accordance with the manufacturers installation procedure.

WITNESS POINT

The Contractor shall ensure precise and accurate construction is carried out under the direct Supervision of the Fish Ecologist. Where installation/construction varies from the design drawings and tolerances, the Contractor shall seek direction from the Fishway Ecologist who shall determine how on-ground works will affect the operations of the fishway passage and may require the Contractor to remediate works completed and recommence installation.

HOLD POINT

Alternatively the Fishway Ecologist may make alterations to the design to suit the site conditions, this shall only be carried out if the affects to fish behaviour and fish passage has been determined to improve the operations of the fish passage design.

HOLD POINT

The Contractor shall carry out any deviation from the design works approved by the Fish Ecologist and authorised by the Superintendent.

8218.6.5.3 Collect As Constructed Details

Prior to commissioning and when the fishway is dewatered, and as directed by the Fishway Ecologist, the Contractor shall make arrangements for "As Constructed" details to be collected, this shall include required survey data capture of the works, measurement of all components installed. Compliance shall be as required by the design drawings, tolerances as outlined in Clause 8218.4.3, and Annexure 8218_1 Cast Insitu Fishway. This shall be reviewed by the Fish Ecologist and if approved shall form the basis of the certification of the works (dry commissioning).

HOLD POINT**8218.6.6 Commissioning of Fishway**

Where temporary works have been carried out to dewater the fishway location within the site the Contractor, upon approval by and under the guidance of the Fishway Ecologist shall remove these temporary works to enable flows through and to the fishway. The Contractor shall carry out these works in a manner which maintains low velocity and low flows until the fishway design hydraulics are prevalent.

**WITNESS POINT**

Once the Contractor has equalized flows to and through the fishway the Fishway Ecologist shall inspect and monitor and adjust any required hydraulic aspects as part of the wet commissioning, making minor alterations, as required, to improve the functioning of the fishway.

The Fish Ecologist shall give final approval of the fishway, and instruct the Contractor to implement the operations and maintenance plan.

HOLD POINT**8218.6.7 Maintenance and Monitoring of Fishway**

The Contractor shall be responsible for the safety, protection, and maintenance of the fishway site . To ensure the continued operation of the fishway passage the Contractor shall carry out regular inspections during the “On Maintenance” period. The inspection regime, reporting mechanisms, and rectification works shall be compliant with the approved and endorsed Operation and Maintenance Management Plan for that specific fishway passage and structures.

HOLD POINT

The Operation and Maintenance Management Plan shall be revised as required and submitted with the “AS Constructed” documentation.

HOLD POINT**8218.6.8 Cleanup and Restoration of Site**

The site is to be cleaned of all debris, excavated material, and construction materials and returned to its natural state prior to works occurring. Disturbed areas are to be rehabilitated as required by the design drawings, and erosion and sediment control measures installed as per the Contractors approved Erosion and Sediment Control Plan and as directed by the Superintendent.

HOLD POINT**8218.7 Post Construction**

Works will not be considered complete and fit for purpose until all test and survey results are submitted and accepted for approval by the Superintendent.

8218.7.1 Collection and submission of all As Constructed data including QA data requirements.

Contractor is to supply and submit Works As-Constructed documentation as required by *MRC D20 - Drawings and Documentation* for approval by the Superintendent 4 weeks prior to requesting a practical completion inspection.

Format of submitted “As Constructed” documentation shall be compliant with MRC Supplementary Specification 8919.

HOLD POINT**8218.7.2 Environmental Control Plan**

Environmental measures are to be kept in place and maintained until the Superintendent approves of the removal of such measures. The Contractor shall maintain such ESC measures for the duration of the works until approved to be removed by the Superintendent.

HOLD POINT



8218.8 Measurement and Payment

Provision for these works shall be included in the scheduled unit rate for the items show in Clause 8218.3 of this Supplementary Specification and Annexure. No separate payment will be made for the works specified within this Supplementary specification or it's annexure.

Version Control:

Version	Description	Reviewed / Endorsed	Date
1.0	New Specification	C. Sultana	10.09.2025