

Flood warning infrastructure network projects: guidance for preparation of Scope of Work (SOW)

Purpose

The purpose of this document is to provide guidance to Queensland local government councils for the preparation of a Scope of Work (SOW) to support the procurement of flood warning infrastructure in Queensland. As the scope of these projects can vary significantly depending on the state of the network (both current and future), types of assets and system integration requirements, a specific SOW template has not been developed. Rather, this document aims to outline the key elements that should be addressed in the SOW, including the various requirements, considerations, examples, and other reference materials that may be of use.

For further advice or guidance, councils are encouraged to reach out to the Queensland Reconstruction Authority (via floodteam@gra.qld.gov.au), the Bureau of Meteorology (the Bureau) (via floodinfrastructure@bom.gov.au) for assets the Bureau may be acquiring through the FWIN Program and therefore required to meet the [Flood Warning Infrastructure Standards](#) or an independent technical Subject Matter Expert (SME), where required.

Queensland's flood warning infrastructure network

Flood warning infrastructure comprises systems that measure and monitor flood conditions in near real-time. Rain and water height sensors, along with multiple channels of communications technologies, relay critical data to agencies such as the Bureau of Meteorology and councils to be interpreted and formed into warnings which are communicated to potentially impacted people including through community-facing disaster dashboards and road signage. This data also feeds into response and recovery planning.

The rainfall and river gauges that inform statewide flood warnings and forecasts conform to the [Flood Warning Infrastructure Standard \(2019\)](#) and are owned and operated by more than 60 entities including state and local government, the private sector, and the Bureau.

Alternative flood warning infrastructure assets are innovative, low-cost devices that can complement the existing *Flood Warning Infrastructure Standard* gauge network and deliver additional flood risk management data (from primarily flash flood environments) and information to communities at risk, usually by quickly activating public alerts and/or activating signage at hot spot locations. These assets will conform with the QRA's *Alternative Flood Warning Infrastructure (Rain and Level Gauges): Guideline for Minimum Requirements*.

Additional asset types used to provide advanced warning of the flood hazard on roadways are:

- **flood cameras** are used to monitor and verify conditions to provide a shared situational awareness to the public and responding agencies, etc. They can be viewed by the community on both council disaster dashboards and Queensland Traffic website <https://qldtraffic.qld.gov.au/>
- **electronic signage** combined with a water level sensor at locations that are frequently inundated will trigger lights and messaging to warn motorists of water over the road
- **road condition information signs at key locations** (usually as travelers leave regional towns) where the hazard can sometimes be hundreds of kilometres away from the location

they are leaving) are used to inform motorists of a range of hazards including flood to avoid them becoming isolated and unable to turn around.

Flood cameras and electronic signage are required to conform to the relevant TMR specifications.

Current standards, guidelines and reference documents

The table below lists the available standards, guidelines and references that can be used to inform the delivery of flood warning infrastructure projects. It is important to refer to these, as appropriate, within the SOW.

Table 1: Current Guidelines and References

Relevant Asset Type	Reference Documents	Description	Source
Rain/River	Bureau of Meteorology Flood Warning Infrastructure Standard	Required for BOM for Rain and River specific performance requirements for infrastructure, sensing, collecting, and communicating data for flood forecasting, and warning purposes.	Refer to website
Rain/River	Specification for PSMs for Stream Monitoring Gauge AHD Height Determination	Required for BOM for Rain and River Gauge specification	Download from QRA website
Rain/River	Bureau of Meteorology Requirements for Installing and Commissioning Flood Warning sites in Australia	Required for BOM for installing river and rainfall gauges	Download from QRA website
		Example Rain River Installation Report developed by supplier.	Download from QRA website
Rain/River	Bureau of Meteorology Application for Station ID Number (including sample application)	Required by the BOM for any asset owner to request a Station ID Number from BoM	Download from QRA website
Rain/River	Bureau of Meteorology Technical Requirements for Gauge Assets Capable of Delivering Necessary Performance to meet Bureau Requirements	The Bureau has statements of requirements related to particular site circumstances that are not currently published. Councils and contractors to liaise with the Bureau technical team directly to ensure clarity on requirements	Bureau Technical Team - floodinfrastructure@bom.gov.au

Relevant Asset Type	Reference Documents	Description	Source
Rain/River	Bureau of Meteorology Mechanical and Installation Drawings for Rainfall Type 1 and Water Level Type 3	Required for BOM for Rainfall Technical Drawings required for installation of assets.	Rainfall – Download zip file from QRA website Water Level – Download zip file from QRA website
Rain/River	Bureau of Meteorology Deed of Confidentiality	Required for BOM if site access is required under an access agreement.	Download from QRA website
Rain/River	Bureau of Meteorology Template Short Form License Agreement – Property Licence	Required for BOM for private property installation	Download from QRA website
Signs	TMR Technical Specification – MRTS14 Road Furniture	Required for TMR Signs for the supply, construction, demolition, removal, salvage, and re-erection of road signs,	Refer to website
Signs	TMR Specification (Measurement) – MRS14 Road Furniture	Required for TMR Signs and applies to the demolition and re-erection of and the supply and construction of road signs.	Refer to website
Signs	TMR Technical Specification – MRTS216 Provision of Road Condition Information Signs	Required for TMR Signs which defines the design, supply, installation, testing & commissioning, performance, documentation, training, maintenance and handover requirements for Road Condition and Information Signs (RCIS) and associated control systems	Refer to website
Camera	TMR Technical Specification – MRTS225 Imaging	Required for TMR cameras for the design, supply, installation, testing and commissioning, performance, documentation, training and maintenance requirements of imaging infrastructure/services for ITS network applications	Refer to website

Relevant Asset Type	Reference Documents	Description	Source
Camera	TMR Specification (Measurement) – MRS225 Imaging	Required for TMR cameras for the supply installation, testing, commissioning and maintenance handover documentation of imaging equipment for ITS applications.	Refer to website
Rain/River gauges on State Owned Roads	TMR Technical Specification – MRTS233 Roadway Flood Monitoring Systems	Required for TMR rain and river gauges on State Owned Roads for the design, supply, installation, testing (Factory Acceptance Test (FAT) and Site Acceptance Test (SAT)) and commissioning, performance, documentation, training and maintenance requirements for roadway flood monitoring systems (RFMS)	Refer to website
Rain/River gauges on State Owned Roads	TMR Specification (Measurement) – MRS233 Roadway Flood Monitoring Systems	Required for TMR rain and river gauges measurements for the supply, installation, testing, commissioning and maintenance handover documentation (including the provision for operator training) of Roadway Flood Monitoring Systems. To be read with in conjunction with MRS263 - Standalone Solar (PV) Power Systems	Refer to website
All assets on State Owned Road	Permits for Access to the Road and Corridor	Required for TMR all assets located on State Owned Road through an online authorisation to undertake activities and install infrastructure in the state-controlled road network.	Refer to website
Alternative Assets	Alternative Flood Warning Infrastructure (Rain and Level Gauges): Guideline for Minimum Requirements	Required for QRA which includes a set of minimum requirements through a Guideline to support all future asset owners to procure quality, fit for purpose assets that meet their identified flood warning needs.	Refer to website

Scope of Works – elements for consideration

Introduction

This section introduces the project by identifying the name of the project, the organisation and the team involved. It also details the specific type of formal agreement that the SOW supports, e.g., Invitation to Offer.

Project overview

This section provides a basic summary of the project, relevant background information and critical objectives that must be met for the project to be a success.

Background

Background information may include a general description of flood warning infrastructure systems as well as an overview of the council's existing flood warning infrastructure network and flood intelligence systems.

Relevant information in this section includes:

- flood warning gauge infrastructure within the catchment, including any known issues with the infrastructure
- network communications, including any known limitations
- how data is communicated to both internal and external stakeholders
- any known limitations of the current system including any issues experienced in previous events.
- what disaster management issues have been highlighted by previous flood events?
- is the catchment subject to flash flooding with limited warning time or is there considerable warning time?
- will the assets comprise of only riverine or is there a need to also incorporate flash flooding, local creeks and or coastal inundation?
- are the assets of use to other local governments (i.e., downstream councils, at risk communities and responding agencies etc.)?
- is there a current understanding of when actions need to be taken (e.g., road closures, evacuation, isolation etc.).

Objectives

This section outlines the overall objectives of the flood warning infrastructure project. Objectives may be defined in terms of outputs, outcomes and/or benefits. Consideration should be given to the purpose of the asset(s), the intended future use of the asset(s), how the data will be used, integration into a local intelligence system, etc.

Project deliverables

This section describes the “what” and should provide a detailed breakdown of all deliverables under the project, including any necessary site and infrastructure details.

For example, the project includes the design, supply, installation and commissioning of flood warning infrastructure at various sites across the Local Government Area (LGA) as outlined in Table X.

Provide a detailed description of each site where new, or upgraded, infrastructure is proposed including:

- Local Government Area (LGA)
- property location/address
- approximate coordinates (final coordinates must be confirmed in writing between the asset owner and contractor before construction)
- access notes and agreements (where relevant).

Project scope

This section provides more details about the specific tasks and technical specifications associated with the works or deliverable(s). The 'Project Scope' details explain the "how".

Where the flood warning infrastructure project is focusing on only one component of the Total Flood Warning System. For example, rainfall monitoring, the project scope should also consider how the outputs of the project will be incorporated into the broader system.

Example scope details for the various flood warning infrastructure asset types are provided in the following sections.

Flood Warning Infrastructure Standard (rain and river height gauges)

Example scope details include:

- hydrologic/hydraulic review and verification of proposed locations in conjunction with the Bureau (noting it is recommended to start this process early and allow 3-4 weeks for confirmation of locations)
- initial feasibility assessment of the proposed sites, including radio path testing, communications, geotechnical and topographic assessments
- consideration and proposal of alternative site(s), where initially proposed site is deemed unfeasible
- confirmation and acceptance of final site selection with the Purchaser
- feature and level survey of each site (where required, to Bureau and TMR standards)
- geotechnical investigation of the existing ground conditions at each site to inform footing design
- protection of existing Public Utility Plant (PUP) during the works
- design of automatic flood warning infrastructure at each site including footings, mounting structure, cabinet layout, flood warning infrastructure equipment layout and access equipment (noting the design of flood warning infrastructure shall meet the requirements of the Flood Warning Infrastructure Standard (2019) and shall be certified by a Registered Professional Engineer Queensland (RPEQ))
- preparation and submission of Bureau of Meteorology (Bureau) Application for Station ID Number form for each flood warning infrastructure gauge (see **Table 1**)
- Dilapidation surveys of all areas identified as forming part of each site prior to commencement of works and again prior to practical completion to confirm the pre- and post-construction condition of each site

- installation of automatic flood warning infrastructure in accordance with the approved design, including environmental management, indigenous cultural heritage management, traffic management, survey set out, monitoring surveys and any necessary approvals/licenses/certificates as required
- installation of permanent survey marks (PSMs) for each flood warning infrastructure site
- commissioning and testing of flood warning infrastructure (see **Table 1**)
- integration of data to Purchaser's existing data management platforms and systems
- handover of all flood warning infrastructure to the Purchaser, including the provision of a specified commissioning report containing as constructed drawings, photos (during construction and at completion), inspection certificates, RPEQ certifications, material test results, etc.
- preparation of operation and maintenance manuals and other support material
- class-based training of council representatives in the operation and maintenance of flood warning infrastructure
- delivery of Defects Liability Period requirements/provision of a warranty period (ensure warranties are transferrable).

Flood cameras

Example scope details include:

- initial feasibility assessment of the proposed sites, including communications, geotechnical and topographic assessments
- consideration and proposal of alternative site(s), where initially proposed site is deemed unfeasible
- confirmation and acceptance of final site selection with the Purchaser
- geotechnical investigation of the existing ground conditions at each site to inform footing design
- protection of existing Public Utility Plant (PUP) during the works
- design, supply, and installation of flood camera including footing(s), mounting structure, camera, electrical and communications equipment and field cabinet (All flood cameras shall meet the requirements of the Transport and Main Roads Technical Specification MRTS225 Imaging)
- environmental management, indigenous cultural heritage management, traffic management, survey set out, monitoring surveys and any necessary approvals/licenses/certificates as required to support the works
- commissioning and testing of camera
- integration of data to Purchaser's existing data management platforms and systems
- integration of data to the Department of Transport and Main Roads' (TMR) ITS platform, STREAMS for sites located on state-controlled roads
- handover to the Purchaser, including the provision of a commissioning report containing as constructed drawings, photos (during construction and at completion), inspection certificates, RPEQ certifications, material test results, etc
- preparation of operation and maintenance manuals and other support material
- class-based training of council representatives in the operation and maintenance of flood warning infrastructure
- delivery of Defects Liability Period requirements/provision of a warranty period.

Signage (electronic and road condition information)

Example scope details include:

- initial feasibility assessment of the proposed sites, including communications, geotechnical and topographic assessments
- consideration and proposal of alternative site(s), where initially proposed site is deemed unfeasible
- confirmation and acceptance of final site selection with the Purchaser
- feature and level survey of each site
- geotechnical investigation of the existing ground conditions at each site to inform footing design
- protection of existing Public Utility Plant (PUP) during the works
- design, supply and installation of signage including footings, posts, sign face, wigwags, LED units, electrical and communications equipment and field cabinet. All signage shall meet the requirements of the relevant Transport and Main Roads TC sign and Technical Specifications MRTS14 Road Furniture and MRTS216 Provision of Road Condition Information Signs
- commissioning and testing
- integration to Purchaser's existing data management platforms and systems
- integration to the Department of Transport and Main Roads' (TMR) ITS platform, STREAMS for sites located on state-controlled roads
- handover to the Purchaser, including the provision of a commissioning report containing as constructed drawings, photos (during construction and at completion), inspection certificates, RPEQ certifications, material test results, etc.
- preparation of operation and maintenance manuals and other support material
- class-based training of council representatives in the operation and maintenance of flood warning infrastructure
- delivery of Defects Liability Period requirements/provision of a warranty period.

Alternative flood warning infrastructure (rain and level gauges)

Example scope details include:

- initial feasibility assessment of the proposed sites, including communications, maintenance, and security
- consideration and proposal of alternative site(s), where initially proposed site is deemed unfeasible
- confirmation and acceptance of final site selection with the Purchaser
- dilapidation surveys of all areas identified as forming part of each site prior to commencement of works and again prior to practical completion to confirm the pre- and post-construction condition of each site
- protection of existing Public Utility Plant (PUP) during the works
- design, supply and installation of alternative flood warning infrastructure in accordance with the QRA's *Alternative Flood Warning Infrastructure (Rain and Level Gauges): Guideline for Minimum Requirements*
- environmental management, indigenous cultural heritage management, traffic management, survey set out, monitoring surveys, as constructed survey and any necessary approvals/licenses/certificates as required to support the works
- commissioning and testing of alternative flood warning infrastructure

- integration of data to Purchaser's existing data management platforms and systems
- handover of alternative flood warning infrastructure to the Purchaser, including the provision of a commissioning report containing as constructed drawings, photos (during construction and at completion), inspection certificates, RPEQ certifications (where applicable), material test results, etc.
- preparation of operation and maintenance manuals and other support material
- class-based training of council representatives in the operation and maintenance of flood warning infrastructure
- delivery of Defects Liability Period requirements/provision of a warranty period.

Technical requirements

This section details the specific technical requirements for the various elements of the scope of works, including:

- technical specifications relevant to the project delivery
- site survey
- design
- BOM Station ID Number (where relevant)
- construction and installation
- data integration.

Providing as much detail as possible for works to be delivered under the contract will result in more detailed tender submissions, facilitate a more thorough evaluation process and will greatly assist in contract management throughout project delivery.

Timeline and schedule

This section should detail the project's schedule and any time constraints, including:

- commencement date of work on site
- completion date of work on site
- date of commissioning of the infrastructure
- date for practical completion

Ensure the Contractor allows time in the program for:

- time to review documents as required under the contract
- potential wet season impacts
- equipment and material availability/supply
- remediation of any outstanding issues identified by customers/users immediately following site commissioning.

Project management

This section should define any administrative processes and requirements associated with delivery of the project. Examples include:

- definition of terms
- works by the Purchaser or Others (where relevant)
- site visits during the tender period.
- dilapidation survey
- prestart meeting
- requirements for possession of site including:
 - Quality Management Plan
 - Work Health and Safety Plan
 - Traffic Management Plan
 - Environmental Management Plan
 - evidence of notice and payment of the portable long service levy to QLeave as required under the contract
 - evidence of insurance as required under the contract
- program and cash flow projection
- performance bond/bank guarantee
- site establishment/disestablishment, services, and security
- specific site agreements/notes including (see Table 1 for relevant supporting documents):
 - state-controlled road corridor access
 - private property access
 - cultural heritage
- site set out
- public utilities

- site supervision
- requests for Information
- purchaser/superintendent inspections and meetings
- quality assurance
- legislative, approvals and other law
- licensing and certificates
- removal of personnel

Submission requirements

This section outlines the information that is required to be provided in the Contractors offer/response, for example:

- a detailed program outlining timeframes for key stages of each deliverable for the project
- a detailed price schedule including provisional sums and variation rates
- full product details of proposed products to be installed (where not specified).

Other items for consideration

Councils should consider a requirement for eligible contractors to be certified by the Australian Hydrographers Association (AHA) with a Certified Practicing Hydrographer (CPH) or have completed the Diploma of Water Operations (hydrography).