



Australian Government
Bureau of Meteorology

WATER MONITORING
STANDARDISATION
TECHNICAL COMMITTEE

National Industry Guidelines for hydrometric monitoring

////////////////////
PART 5: DATA EDITING, ESTIMATION
AND MANAGEMENT

NI GL 100.05–2019
February 2019

Copyright

The *National Industry Guidelines for hydrometric monitoring, Part 5* is copyright of the Commonwealth.

Creative Commons licence

With the exception of logos, the *National Industry Guidelines for hydrometric monitoring, Part 5* is licensed under a Creative Commons Attribution 3.0 Australia licence.



The terms and conditions of the licence are at:

<http://creativecommons.org/licenses/by/3.0/au/>

To obtain the right to use any material that is not subject to the Creative Commons Attribution Australia licence, you must contact the relevant owner of the material.

Attribution for this publication should be:

© Commonwealth of Australia (Bureau of Meteorology) 2019

Acknowledgements

This guideline was initially developed through a project funded under the Australian Government's Modernisation and Extension of Hydrologic Monitoring Systems program, administered by the Bureau of Meteorology. An industry consultation and review process included input from members of a Technical Reference Group convened by the Australian Hydrographers Association.

In 2017 and 2018 the Water Monitoring Standardisation Technical Committee (WaMSTeC) led a periodic review of the National Industry Guidelines for hydrometric monitoring. WaMSTeC subcommittees conducted the review process and coordinated extensive industry consultation.

2018 review subcommittee members:

Jacque Bellhouse (sponsor), Water Corporation, WA
Kevin Dennis (sponsor), Department for Environment and Water, SA
Fabienne d'Hautefeuille, Department of Industry–Lands and Water, NSW
Mark Hopper, WaterNSW, NSW
Max Best, WaterNSW, NSW
David McPhee, Department of Environment, Land, Water and Planning, Vic
Mick Hoban, Department of Environment, Land, Water and Planning, Vic
Kemachandra Ranatunga, Bureau of Meteorology
Linton Johnston, Bureau of Meteorology

Original primary drafting by:

Grant Robinson, then NSW Office of Water, NSW
Paul Langshaw, then Rainmanwater Consulting

(Note that at the time of contribution, individuals may have been employed with different organisations and some organisations were known by other names).

Foreword

This guideline is part of a series of eleven National Industry Guidelines for hydrometric monitoring. It has been developed in the context of the Bureau of Meteorology's role under the *Water Act 2007* (Cwlth) to enhance understanding of Australia's water resources.

The Bureau of Meteorology first published these guidelines in 2013 as part of a collaborative effort amongst hydrometric monitoring practitioners to establish standardised practice. They cover activities relating to surface water level, discharge and water quality monitoring, groundwater level and water quality monitoring and rainfall monitoring. They contain high level guidance and targets and present non-mandatory Australian industry recommended practice.

The initial versions of these guidelines were endorsed by the Water Information Standards Business Forum (the Forum), a nationally representative committee coordinating and fostering water information standardisation. In 2014, the functions and activities of the Forum transitioned to the Water Monitoring Standardisation Technical Committee (WaMSTeC).

In 2017, as part of the ongoing governance of the guidelines, WaMSTeC initiated a 5-yearly review process to ensure the guidelines remain fit-for-purpose.

These revised guidelines are the result of that review. They now include additional guidance for groundwater monitoring, and other updates which improve the guidelines' currency and relevance. WaMSTeC endorsed these revised guidelines in December 2018.

Industry consultation has been a strong theme throughout development and review of the eleven guidelines. The process has been sponsored by industry leaders and has featured active involvement and support from the Australian Hydrographers Association, which is considered the peak industry representative body in hydrometric monitoring.

These guidelines should be used by all organisations involved in the collection, analysis and reporting of hydrometric information. The application of these guidelines to the development and maintenance of hydrometric programs should help organisations mitigate program under-performance and reduce their exposure to risk.

Organisations that implement these guidelines will need to maintain work practices and procedures that align with guideline requirements. Within the guidelines, the term “shall” indicates a requirement that must be met, and the term “should” indicates a recommendation.

The National Industry Guidelines can be considered living documents. They will continue to be subject to periodic WaMSTeC review at intervals of no greater than five years. In the review phase, WaMSTeC will consider any issues or requests for changes raised by the industry. Ongoing reviews will ensure the guidelines remain technically sound and up to date with technological advancements.

National Industry Guidelines for hydrometric monitoring

This document is one part of the National Industry Guidelines for hydrometric monitoring series, which can be found at

<http://www.bom.gov.au/water/standards/niGuidelinesHyd.shtml>.

The series contains the following parts:

Part 0: Glossary

Part 1: Primary Measured Data

Part 2: Site Establishment and Operations

Part 3: Instrument and Measurement Systems Management

Part 4: Gauging (stationary velocity-area method)

Part 5: Data Editing, Estimation and Management (*this guideline*)

Part 6: Stream Discharge Relationship Development and Maintenance

Part 7: Training

Part 8: Application of Acoustic Doppler Current Profilers to Measure Discharge in Open Channels

Part 9: Application of in-situ Point Acoustic Doppler Velocity Meters for Determining Velocity in Open Channels

Part 10: Application of Point Acoustic Doppler Velocity Meters for Determining Discharge in Open Channels

Part 11: Application of Surface Velocity Methods for Velocity and Open Channel Discharge Measurements

Table of Contents

- 1 Scope and general7
 - 1.1 Purpose.....7
 - 1.2 Scope.....7
 - 1.3 Application7
 - 1.4 Bibliography7
 - 1.5 Definitions7
- 2 Minimum requirements.....8
 - 2.1 Capture of primary measured data8
 - 2.2 Editing of data8
 - 2.3 Estimation of data8
 - 2.4 Data management.....8
- 3 Recommendations9
- Appendix A Training10

National Industry Guidelines for hydrometric monitoring

Part 5: Data Editing, Estimation and Management

1 Scope and general

1.1 Purpose

The purpose of this document is to provide guidelines for recommended practice to ensure traceability of all data editing and estimation and to set minimum requirements for hydrometric data management.

1.2 Scope

This document provides guidelines for hydrometric data editing, estimation and management.

1.3 Application

This guideline applies to the management of stored hydrometric data including editing, correcting, estimating and quality coding.

This guideline does not apply to field based data storage.

1.4 Bibliography

Cognisance of the following was taken in the preparation of this guideline:

- Standards Australia/Standards New Zealand, *Quality management systems—Requirements, AS/NZS ISO 9001:2016*.

1.5 Definitions

For the purpose of this guideline, the definitions given in National Industry Guidelines for hydrometric monitoring, Part 0: *Glossary*, NI GL 100.00–2019 apply.

2 Minimum requirements

The minimum requirements for editing, estimation and management of stored hydrometric data are described in sections 2.1 to 2.4 below.

2.1 Capture of primary measured data

1. Hydrometric data shall be transferred from the field and reviewed, following organisational procedures, in a time frame appropriate to the intended purpose.
2. All primary measured data (including telemetered or field downloaded) shall be considered unvalidated data until it has been reviewed and validated against the spot check (observed reference field visit values).
3. All primary measured data shall be permanently retained and archived in an unedited form. In addition, organisations should store a copy of the primary measured data in a secure long term medium in a non-proprietary format.
4. Relevant reference readings (spot checks) shall be captured at regular intervals (at least annually) to validate the primary measured data.

2.2 Editing of data

1. Data validation shall check primary measured data against a calibrated reference value, and shall check time in data logger against local time, prior to the data being assigned an appropriate quality code.
2. Comments recorded with the primary measured data shall be reviewed as part of the validation process.

2.3 Estimation of data

Estimation of data shall be undertaken and documented such that it is fit for purpose.

2.4 Data management

1. All data management including transfers, validations, edits, corrections and estimations (e.g. correlation between adjacent stations or numerical simulation) should be described with sufficient detail to permit full traceability (e.g. author, date/time stamp and ability to undo/redo). All checked, edited, corrected and/or estimated data shall be assigned a quality code (See National Industry Guidelines for hydrometric monitoring, Part 1: *Primary Measured Data*, NI GL 100.01–2019) descriptive of the processed data.
2. All primary measured data and processed data shall be stored and backed up (archived) sufficiently to ensure its continued accessibility.
3. Organisations shall maintain evidence that staff who undertake data editing, estimation and management have appropriate competency.

3 Recommendations

In addition to the above mandatory requirements it is highly desirable that:

- a) a data management system provides facilities for viewing, editing and reporting on data, sufficient to enable independent audit and quality control (e.g. reference AS/NZS ISO 9001:2016); and
- b) organisations document procedures and methods used to meet the guideline for the following:
 - data editing
 - data estimation
 - data management methods.

Appendix A Training

A.1 Training session outline

LEARNING ELEMENTS	RESOURCES	DESCRIPTION	
Identify and understand the 1.1 Purpose, 1.2 Scope and 1.3 Application of this guideline	Copies of all guidelines documents. Access to all reference material.	Discussion with reference to the guidelines document.	Face to face
2 Minimum requirements 2.1 Capture of primary measured data 2.2 Editing of data 2.3 Estimation of data 2.4 Data management	Copies of all guidelines documents. Access to all reference material.	Identify and explain the minimum mandatory requirements for editing, estimation and management of stored hydrometric data.	Face to face
3 Recommendations	Copies of all guidelines documents. Access to all reference material.	Identify and explain the highly desirable requirements for editing, estimation and management of stored hydrometric data.	Face to face

A.2 Training learning resources

A.2.1 Introduction

Welcome to the learner resource for National Industry Guidelines for hydrometric monitoring, Part 5: *Data Editing, Estimation and Management*, NI GL 100.05–2019. The purpose of this resource is to develop your knowledge and skills and improve your competency in this guideline.

A.2.2 Section references

The table below shows elements of the guideline that are covered in this Learner Resource. This may help the learner to map their progress as they work their way through this resource.

Section	Unit Element
1 Scope and general	1.1 Purpose 1.2 Scope 1.3 Application 1.4 Bibliography
2 Minimum requirements	From the text of the guideline explain the minimum mandatory requirements for editing, estimation and management of stored hydrometric data.
3 Recommendations	From the text of the guideline explain the highly desirable requirements for editing, estimation and management of stored hydrometric data.

A.2.3 Who needs this competency?

This learning material covers the skills and knowledge required for a person to use and understand National Industry Guidelines for hydrometric monitoring, Part 5: *Data Editing, Estimation and Management*, NI GL 100.05–2019.

A.2.4 Learning outcomes

At the completion of this learner resource you will be competent in the following:

- use the guideline document for reference
- use the guideline in day to day operations
- access the material referenced in the guideline document
- use and understand related internal procedures and work instructions.

A.2.5 Health and safety considerations

Health and safety legislation shall always be considered when implementing National Industry Guidelines, workplace procedures and work instructions.

Employees carrying out work related to the National Industry Guidelines should be adequately trained in all relevant health and safety matters.

A.2.6 What resources will I need?

- Workplace policies and procedures
- Manufacturer manuals, requirements and specifications
- Codes of practice
- Workplace equipment, tools and instruments
- Workplace reports
- Workplace maps, plans and instructions
- Permits and access to locations and worksites

Other useful resources

- Relevant Health and Safety Act
- Safe Work Australia Model Codes of Practice
- Organisations procedures and work instructions
- Australian Standards