Australian Government

Department of Education, Employment and Workplace Relations

# NWP510A Develop and maintain ratings

**Revision Number: 2**

# NWP510A Develop and maintain ratings

## Modification History

NWP510A Release 2: Layout adjusted. No changes to content.
NWP510A Release 1: Primary release.

## Unit Descriptor

This unit of competency describes the outcomes required to establish relationships between variables such as stage versus flow, conductivity versus salinity. This unit requires understanding of the processes required to collect data accurately, interpret data, verify data and produce clear reports that conform to organisational and industry standards.

## Application of the Unit

This unit supports the attainment of skills and knowledge required for assistant hydrographers, field hydrologists and water operators responsible for reporting water quality, volume and flow in water systems.

## Licensing/Regulatory Information

Not applicable.

## Pre-Requisites

Not applicable.

## Employability Skills Information

This unit contains employability skills.

## Elements and Performance Criteria Pre-Content

| | |
|---|---|
| Elements describe the essential outcomes of a unit of competency. | Performance criteria describe the performance needed to demonstrate achievement of the element. Where ***bold italicised*** text is used, further information is detailed in the range statement. Assessment of performance is to be consistent with the evidence guide. |

# Elements and Performance Criteria

| ELEMENT | PERFORMANCE CRITERIA |
|---|---|
| **1 Review individual measurements**. | 1.1 Identify purposes of ratings.<br>1.2 Review measurements and compare against expected trends.<br>1.3 Use ***standard processes and software*** to check, edit and verify field data.<br>1.4 Correct and adjust inconsistent data. |
| **2 Develop rating curves**. | 2.1 Analyse existing measurements to establish trends and compare with existing ratings.<br>2.2 Identify sources of error in ratings.<br>2.3 Prepare rating curves based on measurements and agreed formulae and ***mathematical techniques*** under a ***variety of hydraulic conditions*** and ***control types***.<br>2.4 Confirm and verify existing trend or define new trend.<br>2.5 Develop rating curves which comply with industry and client requirements.<br>2.6 Use ***theoretical methods*** to create or extend ratings.<br>2.7 Document processes and observations to provide traceability and accountability for quality assurance.<br>2.8 standard formulas to create ratings for pre-calibrated measuring structures.<br>2.9 Apply quality codes to rating curves. |
| **3 Maintain rating curves**. | 3.1 Confirm accuracy of rating curves using recent measurements and review trends and rating applicability.<br>3.2 Develop rating curves based on new information from reviews and changed conditions.<br>3.3 Retrieve and analyse current, historic and trend data using appropriate mathematical techniques and in accordance with organisational procedures.<br>3.4 Document processes and observations and adjustments made. |
| **4 Report rating curves**. | 4.1 Check rating curves covers full stage range.<br>4.2 Prepare and store required ***archival data*** according to organisational procedures for data security.<br>4.3 Prepare and disseminate ratings in accordance with client requirements.<br>4.4 Make recommendations for future observations. |

# Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

**Required skills**:

- collect and analyse data
- apply mathematical modelling and analytical tools
- interpret and apply technical documentation to the collection, analysis and reporting of hydrometric data
- identify and address potential or actual operational problems
- record information and prepare reports and interpret a range of organisational documents
- use computer systems and use various computer programs&spreadsheets to create ratings
- use remote work communication systems
- check hydrometric data for correctness and accuracy in preparation for creating ratings
- identify characteristics of ratings appropriate to various cross section types&flow
- regimes
- identify incorrect and impossible ratings
- adjust gaugings, hydrograph trace and ratings to a common datum
- create ratings manually using various methods
- create ratings for standard measuring structures
- develop rating techniques to handle seasonal rating changes
- identify the possibilities and limitations of scale models for generating ratings
- identify and recognise causes of progressive, cyclical and sudden rating changes
- identify backwater-affected stations and use appropriate techniques to rate them
- identify gradual stream changes and adopt appropriate rating techniques
- identify short-term rating changes, their causes and means of correctly processing them
- apply Student's T test to determine whether a new rating is required
- draw an accurate rating by hand
- fit a rating curve using a number of mathematical techniques available in HYDSYS HYRATED
- identify the probable error of a rating, and understand its significance
- identify gross errors in ratings and the data used to compile them
- apply appropriate quality codes to a rating
- identify the elements of a stream bed&channel that affect ratings
- estimate channel roughness from photographs
- calculate the overall roughness coefficient of a channel consisting of a number of elements
- use graphical logarithmic methods to extend a rating
- identify appropriate sections to use for slope-area flow calculations

- manually calculate flow rates using a set of cross sections and a long section
- use a spreadsheet to perform calculations
- make correct measurements and calculate flow rates through and over various structures

**Required knowledge**:

- mathematical and other scientific techniques relevant to the analysis of hydrometric data
- Student's T test
- the elements of a stream bed&channel that affect the rating
- the relationship between Chezy&Manning roughness coefficients
- computer software relevant to the analysis and archiving of hydrographic data
- the basis of statistical goodness of fit tests
- occupational health and safety procedures
- policies and standard operating procedures

# Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

**Critical aspects for assessment and evidence required to demonstrate competency in this unit**

The candidate should demonstrate the ability to establish relationships between variables such as stage versus flow and conductivity versus salinity including:

- gathering and interpreting complex documentation and applying it to the development and maintenance of rating curves
- analysing and verifying data using standard procedures, software and databases
- preparing clear and accurate reports
- storing and archiving data
- identifying, reporting and providing solutions to a range of flow conditions

**Context of and specific resources for assessment**

Access to the workplace and resources including:

- documentation that should normally be available in a water industry organisation
- workplace specific equipment and technology
- supervision and experienced team members to provide observations, feedback and third party reports
- enterprise operating procedures and work allocation
- relevant codes, standards, and government regulations

Where applicable, physical resources should include equipment modified for people with disabilities.

Access must be provided to appropriate learning and/or assessment support when required.

Assessment processes and techniques must be culturally appropriate, and appropriate to the language and literacy capacity of the candidate and the work being performed.

Validity and sufficiency of evidence requires that:

- competency will need to be demonstrated over a period of time reflecting the scope of the role and the practical requirements of the workplace
- where the assessment is part of a structured learning experience the evidence collected must relate to a number of performances assessed at different points in time and separated by further learning and practice
- a decision of competence should only be made when the assessor has complete confidence in the person's

competence over time and in various contexts

- all assessment that is part of a structured learning experience must include a combination of direct, indirect and supplementary evidence
- where assessment is for the purpose of recognition (RCC/RPL), the evidence provided will need to be authenticated and show that it represents competency demonstrated over a period of time
- assessment can be through simulated project-based activity and must include evidence relating to each of the elements in this unit

In all cases where practical assessment is used it will be combined with targeted questioning to assess the underpinning knowledge. Questioning will be undertaken in a manner appropriate to the skill levels of the operator, any cultural issues that may affect responses to the questions, and reflecting the requirements of the competency and the work being performed.

# Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. ***Bold italicised*** wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

| | |
|---|---|
| ***Standard processes and software*** may include: | • standards relevant to preparation of rating<br>• procedures for the development, maintenance and extension of rating curves<br>• computation of flow from stage data and rating curves<br>• software (Kisters - Hydstra, Scientific Software Group - AquaChem, Microsoft - Excel)<br>• web-based development tools for presentation and reporting of data |
| ***Mathematical techniques*** may include: | • logarithmic transformation<br>• conversion of units<br>• graphical analysis<br>• gauging calculations<br>• calculation of sediment load, sediment yield and sediment deposition |
| ***A variety of hydraulic conditions*** may include: | • rapidly rising and falling stages<br>• tail water and backwater affected<br>• tidal effects<br>• transitional from calibrated to channel<br>• control sensitivity<br>• siltation & control changes |
| ***Control Types*** may include: | • sectional controls<br>• partial controls<br>• channel controls |
| ***Theoretical methods*** may include: | • Mannings<br>• Chezy<br>• A(D<br>• HECRAS |
| ***Archival data*** may include: | • archive structure<br>• period of applicability<br>• rating equations |

# Unit Sector(s)

Not applicable.

## Competency field

Hydrography.