AHA Training — 2020 and Beyond

28 March 2021

Contents

1. Preamble

The purpose of this document is to develop a comprehensive system that incorporates industry training requirements, recognised qualifications and professional certification.

1.1 Acronyms

- AHA *Australian Hydrographers Association*
- ASQA *Australian Skills Quality Authority*
- BOM *Bureau of Meteorology*
- CAH *Certified Associate Hydrographer* (awarded by AHA)
- CCH *Certified Cadet Hydrographer* (awarded by AHA)
- CPH *Certified Practising Hydrographer* (awarded by AHA)
- CPS *Certified Practising Specialist* (proposed to be awarded by AHA)
- MOU *Memorandum of Understanding*
- RCC *Recognition of Current Competency*
- RPL *Recognition of Prior Learning*
- RTO *Registered Training Organisation*
- TAFE *Technical and Further Education*
- TTC *Timber Training Creswick*

1.2 Background

1.2.1 History of AHA Training

- *Hydrography basics* training developed by AHA
  - 2008:
    1. Developed with support from BOM Modernisation and Enhancement funding
    2. Course offered face-to-face from 2009-2013, RPLs offered to recognised qualification
    3. Rebranded 2013 as *Introduction to Hydrography* and offered by distance learning, no RPLs available

- Training developed by AHA which includes syllabus requirements of Diploma Units
  Note: AHA is complying with requirements to obtain RPL for a qualification recognised by ASQA.
  - 2015-2017:
    - Presented by AHA trainers from 2015
    - On completion, apply for RPL for Units of Competency for Diploma 50117 (2015-2017)
  - 2018-2021:
    - Presented by AHA trainers from 2018
    - On completion, apply for RPL for Units of Competency for Diploma 50715 (2018-2020)
  - 2021-:
    - Presented by AHA trainers and mentors from 2021
    - Delivered in partnership with RTO Timber Training Creswick (TTC)
    - On completion, AHA Trainers accredited by TTC assess Units of Competency for Diploma 50118 (2021-)

- Bespoke training
    - 2018-:
        - Hydrography Fundamentals
        - Developed and taught at BOM Office in Canberra 2018
    - 2020-:
        - *Open channel meter validation in NSW* course developed
        - Developed by AHA to meet requirements of NSW Department of Primary Industry and Environment at their expense

1.2.2 History of Qualifications

Qualifications

Since 2001, hydrographers have had the following options nationally: Certificate IV, Diploma[*] and Skill Set. Over the last 10 years, AHA has been promoting Diploma level training.

- **Certificate IV in Water Industry Operations** (NWP40101)
  Released 21 Sep 2001 | Deleted 11 Mar 2008

- **Diploma of Water Industry Operations (**NWP50101**)**
  Released 21 Jan 2001 | Deleted 11 Mar 2008

- **Certificate IV in Water Operations** (NWP40107
  Released 12 Mar 2008 | Deleted 6 Dec 2015 - Required nine units of competency

- **Diploma of Water Operations (**NWP50107**)**
  Released 12 Mar 2008 | Updated 30 Apr 2012 | Deleted 6 Dec 2015 - Seven units of competency

- **Hydrography Basics Skill Set (NWPSS00005)**
  Released 7 Dec 2015 | Current Skill Set - Requires three units of competency.
  NOTE: Students who successfully completed AHA *Hydrography Basics* (now known as *Introduction to Hydrography*) were given RPLs for the three Units of Competency.
    - 18 Jan 2021 | ASQA approved RTO Timber Training Creswick in partnership with AHA to deliver this course

- **Certificate IV in Water Industry Operations** (NWP40515)
  Released 7 Dec 2015 | Current Cert IV - Requires 11 units of competency

- **Diploma of Water Industry Operations (NWP50715)**
  Released 7 Dec 2015 | First AHA students 1 Feb 2018 | Will end 20 June 2021
    - Upon AHA representations to Australian Skills Quality Authority, extended to 20 Dec 2020
    - Subsequently extended to 20 June 2021[†]
    - Includes *Hydrography* speciality elective
    - Requires nine units of competency

[*] The Diploma is sometimes incorrectly referred to as Certificate V
[†] https://www.asqa.gov.au/news-events/news/further-extension-transition-period-nwp50715-diploma-water-industry-operations

- Delivered by AHA through Riverina Institute of TAFE NSW / TAFE NSW
- Delivered by ALS through Wide Bay Qld TAFE / TAFE Qld

- **Diploma of Water Industry Operations (NWP50118)**
  Released 21 Dec 2018 | Current Diploma | Previously offered by Simmons and Bristow only
  - Includes *Hydrometric Monitoring* speciality elective.
  - Requires ten units of competency.
  - 18 Jan 2021 | ASQA approved RTO Timber Training Creswick in partnership with AHA to deliver this course

- **Hydrometric Monitoring Basics Skill Set (NWPSS00013)**
  Released 22 Jan 2021 | Current Skill Set - Requires three units of competency.
  - TTC will upgrade during 2021 to deliver this qualification

- **Certificate IV in Water Industry Operations** (NWP40120)
  Released 22 Jan 2021 | Current Skill Set - Requires 10 units of competency.

Providers

- **OTEN (NSW TAFE)** prior to 2014
  - This RTO – a division within TAFE NSW – provided training services for a number of years to AHA members.
  - OTEN changed its policies so that only residents of NSW could access its services.

- **Institute of Training**—Warren Jack (2014)
  - Several months were invested in building an arrangement with this RTO. As far as we are aware, no students were ever trained through this arrangement.

- **Canberra Institute of Technology** (2015-2016)
  - This arrangement began with about 6-10 students per year.
  - Canberra Institute of Technology later cancelled the arrangements with 4-6 weeks notice.
  - AHA was unable to access the list of enrolled students.

- **Riverina Institute of TAFE NSW** (2017-2018).
  - AHA had a three year written agreement with the Riverina RTO which ceased to exist on 31 December 2018.
  - During 2018 the Riverina Institute ceased independent operations and were consolidated into a state-wide TAFE NSW.

- **TAFE NSW** (2018-2021)
  - Transition from Riverina RTO to TAFE NSW occurred during 2018.
  - In December 2018, TAFE NSW advised AHA that they would not continue to provide training services. On representations, they reconsidered their position and agreed to continue to provide services per the previous written agreement for the interim time.
  - During 2020 TAFE advised that the agreement will cease on completion of Diploma NWP50715 in June 2021.

- **Wide Bay TAFE** (Qld)
  - ALS independently used this RTO as a service provider.
  - No written contract existed.
  - Wide Bay TAFE has now merged with TAFE Qld.

- **Timber Training Creswick** (Vic) (2020-)
  - MOU signed 2 Sep 2020
  - Approved by ASQA to deliver Diploma NWP50118 and Skill Set NWPSS00005 15 January 2021

1.2.3 History of AHA Certification

2009 system

The initial certification scheme was launched in 2009. The scheme originally had three levels:

- AHA Cadet Hydrographer
- AHA Certified Practising Hydrographer
- AHA Certified Qualified Hydrographer

With Federal funding, some 250 students completed the Hydrography Basics course and were given *Cadet* level certification between 2009-2013. Many of those did not see value in maintaining certification after the initial period.

Up to 2013, only seven people were certified at the CAH Associate (originally Practising) level, and another 14 at the CPH Practising (originally Qualified) level.

2015 system

In 2015, AHA revised the terminology and definitions:

AHA Cadet Hydrographer (CCH)
This is a person whom has EITHER of the following:

- Attained either "AHA Hydrography-Basics course" or "Skill Set"
- Less than 3 years Hydrographic industry experience

AHA Certified Associate Hydrographer (CAH)
This is a person whom has BOTH the following:

- Proven in-house and/or external training or qualification in a discipline associated to hydrography.
- Minimum 3 years proven experience in most aspects of hydrography.

AHA Certified Practising Hydrographer (CPH)
This is a person whom has the following:

- Minimum 5 years proven experience across ALL aspects of hydrography (these aspects will be specified by AHA)

PLUS ONE OF THE FOLLOWING

- Proven qualification specific to hydrography (i.e. Cert IV hydrography, SMHEA – hydrography course, Certificate Hydrography / Surface Water Hydrology, Diploma of Water Operations or a qualification deemed appropriate by the AHA)

OR

- Diploma – Water Operations plus Hydrography Skill Set or Hydrography Basics

Number of certified professionals

Following rebranding in 2015 and extended marketing, certification has matured:

	CCH	CAH	CPH
New		5	16
Renewal		4	58
Grand Total	**0**	**9**	**74**

NUMBER OF CERTIFIED PROFESSIONALS AT 8 MAY 2019

	CCH	CAH	CPH
New	7	11	35
Renewal		5	74
Grand Total	**7**	**16**	**109**

NUMBER OF CERTIFIED PROFESSIONALS AT 16 JUNE 2020

1.3 Recognition: Qualifications and Certification

1.3.1 Qualifications

Qualifications (such as a Skill Set, Cert III, Cert IV, Diploma) are awarded by a Registered Training Organisation (RTO)

1.2.1.1 Benefits of recognised subjects and qualifications

- Students want a certificate at the end of a course which is recognised nationally and can be used as a credit towards future Vocational and Educational Training studies.
- Qualifications delivered under the Australian Qualifications Framework such as a Diploma and Certificate IV are recognised and portable across the country.

1.2.1.2 Development of recognised subjects and qualifications

- The current process of developing courses involves multi-disciplinary teams led by an organisation such as Australian Industry Standards (http://www.australianindustrystandards.org.au/) prior to formal recognition by the Australian Skills Quality Authority (https://www.asqa.gov.au).
- The length of this process means that requests for change from industry cannot be implemented quickly.
- AHA would like to implement an approach which recognises subjects approved by ASQA, but has the flexibility to respond quickly to new techniques and technology.

Observations:

AHA Committee has identified a gap between training someone to be competent (meet industry requirements) and merely assessing someone to be qualified (Diploma).
The focus over the last 12 months has been to identify principles and competencies that industry requires and find a method of integrating this with the individual “need” for a qualification.

In terms of offering qualifications it is important to note that there has been
a) no consistent qualification on offer over time,
b) no consistent provider, and
c) the future is far from certain and offers little hope for stability in either aspect.

Qualifications do not necessarily include training, but simply an assessment of limited competencies.

AHA also has a concern that:

- candidates have never been required to study all the fundamental principles and competencies identified by AHA. For example, under Diploma 50118 rules, the only requirement is to study 4 units within the *Hydrometric Monitoring* speciality elective group.
- units of competency such as station establishment and instrument management and fundamental principles such as electronics are not included in the current Diploma.
- a person who has completed the Diploma may not be sufficiently trained or competent to fulfil the role of a hydrographer, and
- educational authorities and institutions do not hear and respond to needs of industry in a timely manner.

1.3.2 Certification

Professional Certification is awarded by AHA.

1.2.2.1 Benefits of certification

Certification is an industry-owned and managed recognition scheme. Recognition of skills and experience of personnel is essential if we as an industry are to be part of the solution of sustainable water resources.

The intention is that ALL surface and groundwater Hydrographers will be registered on the AHA register of Certified professionals.

Certification is voluntary, however certified Hydrographers help to raise the profile of hydrometric monitoring as an industry, and improve skills, knowledge, standards across the Australia – which in turn will help the hydrometric monitoring industry control its own future and become more sustainable. There are personal benefits too – as certified Hydrographers gain recognition for skills and have better prospects for their future careers.

1.2.2.2 Development of a certification strategy aligned with other professional bodies

In 2015 AHA certification program was tweaked. Names of the certification levels were changed to be more consistent with practice in other associations.

- AHA Cadet Hydrographer (CCH)
- AHA Certified Associate Hydrographer (CAH)
- AHA Certified Practising Hydrographer (CPH)

AHA introduced post nominals (i.e. the three letters) indicating the level of certification after your name, e.g. **John Doe CPH**

We see value in the model that the pathway followed by many professional certification bodies:

- Training and qualification
- Professional Experience
- Additional training and assessment
- Professional certification
- Continuing professional development
- Recognition of Prior Learning (RPL) or Recognition of Current Competency (RCC)

Observations:

AHA has identified shortcomings are in two areas:

- Requirements for initial certification
- Requirements for Continuing Professional Development (CPD) for tracking skills, knowledge and experience

Requirements for initial certification

In practice it is difficult to assess:

- what is proven training?
- how AHA assesses that a qualification is deemed appropriate?
- if a person who has an existing qualification has covered the breadth of topics that a modern hydrographer needs to operate efficiently and competently?

At present we are unsure whether people certified as CAH and CPH have the required breadth of skills.

Requirements for CPD

For CCH, the current CPD requirements appear unduly complex.

For CAH and CPH, the system is complex and biased and favours people whose employer provides frequent training and funds to attend the biennial conference. The point system is arbitrary and not always possible for candidates who are at the top of their profession and keeping their skills up to date to accrue sufficient points for recertification.

There is no provision in current guidelines for assessing relevant experience as one of the CPD criteria for maintaining certification.

2. Proposal — 2020 and Beyond

AHA seeks to deliver hydrometric monitoring training and certification which:

- Meets the needs of the Australian industry, including employers and regulators and is able to respond to changing requirements in a timely manner;
- Incorporates requirements of relevant Units of Competency as described at http://training.gov.au where they exist;
- Identifies additional subject content requirements beyond those identified at http://training.gov.au;
- Assists AHA members to develop and maintain their skills and be recognised by employers, regulators and the public through qualifications and certification;
- Has defined pathways (through training or RPL or RCC) and follows industry practice in professional certification and continuing professional development
- Complies with the certification system in AS17024:2013 *Conformity assessment — General requirements for bodies operating certification of persons.*

2.1 Proposed AHA Training System

In essence, the *AHA 2020 and Beyond* model attempts to provide a complete list of subjects required by hydrographers to perform their duties and, where possible, links each subject to a potential Unit of Competency.

The training system is based on a phased approach:

2.1.1. Induction

The **Induction Course** is designed to introduce a student to the broad concepts involved in the profession.

IC1.1	Hydrological cycle
IC1.2	Terminology
IC1.3	Equipment
IC1.4	Work environment
IC1.5	Principles and Competencies defined

2.1.2. Fundamental Principles

Fundamental Principles are things you need to know and understand rather than do.
AHA Fundamental Principle subjects will provide teaching material to help you understand these principles.

Fundamental principles are the theoretical component that underpins the practical elements of training.

F1. Resource monitoring
F2. Statistics and uncertainty
F3. Spatial information
F4. Hydrometric data and applications
F5. Meteorology and the water cycle
F6. Principles of Hydraulics

F7. Groundwater basics
F8. Water quality
F9. Electronics
F10. Regulation / legislation (provide Legal framework nationally and in each jurisdiction)
F11. Health and Safety
F12. Customer requirements and quality management

2.1.3. Competencies

Competencies are things you need to be able to do.
The focus of AHA Competency subjects is on the job learning, most concepts will be introduced through Fundamental Principles subjects.

2.1.3.1 Core Competencies

These are the practical skills required by all hydrographers.

CC1. Hydrometric data
CC2. Gaugings
CC3. Ratings
CC4. Hydrometric site operations
CC5. Groundwater monitoring
CC6. Water quality monitoring
CC7. Instrumentation
CC8. Surveying of monitoring sites
CC9. Applied Hydraulics

2.1.3.2 Elective Competencies

These are the practical skills required by hydrographers progressing to the senior levels of the profession.

EC1. Meteorological data
EC2. Project Management
EC3. Technical Report Writing
EC4. Manage hydrographic surveying
EC5. Financial management

2.1.3.3 Speciality Competencies

These are some of the specialities practised by hydrographers who may have no need to complete elective competencies.

SC1. Data Management
SC2. Surface Velocity Measurement (inc. Drones, Radar & Remote Sensing)
SC3. Metering (open channel)
SC4. Telemetry
SC5. Hydraulic Modelling (HEC-RAS)
SC6. Management (Technical Report Writing, Financial Management, Human Resources Management, Project Management)
SC7. Hydrographic surveying
SC8. Instrumentation Management
SC9. Flood site operations

2.2. Mapping between AHA Training and Qualifications

The following table shows AHA training subjects and Units of Competency which are included in the AHA subjects. It also highlights that Units of Competency have not been identified for some of the subjects considered essential for hydrographers.

AHA training is designed to meet or exceed the requirements of Units of Competency for the Diplomas, Skill Set and other qualifications.

In some cases completing a Unit of Competency from another training provider may not meet the requirements of AHA Fundamentals and Competencies.

The table shows the units where they are part of Hydrometric Monitoring Basics Skill Set NWPSS00013, Certificate IV in Water Industry Operations NWP40120, Diploma 50118 and other qualifications:

AHA Subject	Skill Set NWPSS00013*	Cert IV NWP40120*	Diploma NWP50118	Other qualifications
Fundamental Principles				
F1: Resource monitoring		NWPGEN005 Coordinate and monitor the application of environmental plans and procedures	NWPGEN006 - Implement and manage environmental management policies	NWPGEN006 - Implement and manage environmental management policies
			NWPHYD004 - Plan water resource management	
F2: Statistics and uncertainty		FSKNUM021 Apply an expanding range of arithmetical calculations for work	FSKNUM27 - Collect, organise and interpret statistical data for work	
F3: Spatial information			CPPSIS4022 - Store and retrieve spatial data CPPSIS5040 - Interpret & collate spatial data	
F4: Hydrometric data and applications				
F5: Meteorology and the water cycle				
F6: Principles of flow measurement			NWPHYD002 - Apply principles of open channel hydraulics	NWPHYD001 - Apply principles of open channel hydraulics [Superseded]
F7: Groundwater basics			NWPIRR004 - Develop and review a groundwater plan	
F8: Water quality			NWPGEN006 Implement and manage environmental management policies	NWPGEN003 Apply environmental and licensing procedures of the water industry NWPGEN004 Assess, implement and report environmental procedures NWPGEN005 Coordinate and monitor the application of environmental plans and procedures‡
F9: Electronics				Units from UEE21911 Certificate II in Electronics
F10: Regulation / Legislation		NWPGEN032 Ensure compliance with water industry standards, guidelines and legislation	NWPGEN016 - Interpret and comply with regulatory requirements	NWPGEN002 - Ensure compliance with water industry standards, guidelines and legislation [Superseded]
F11: WHS		BSBWHS411 Implement and monitor WHS policies, procedures and programs	TLIF4014 - Develop and maintain a safe workplace	BSBWHS502 - Manage effective WHS consultation and participation processes [Superseded]
F12: Customer requirements and quality management				

‡ These units are part of Skill Set *NWPSS00008 Water quality monitoring*

AHA Subject	Skill Set NWPSS00013*	Cert IV NWP40120*	Diploma NWP50118	Other qualifications
Core Competencies				
CC1: Hydrometric data		MSL924003 Process and interpret data	NWPHYD005 - Process and report hydrographic time series data	MSS025019 - Report environmental data[§] NWPHYD016 - Process and report hydrographic time series data[**] [Superseded]
CC2: Gaugings	NWPHYD007 - Measure discharge using wading method	NWPHYD007 - Measure discharge using wading method NWPHYD006 - Measure and process medium and high flows using a range of methods and equipment[§]	NWPHYD007 - Measure discharge using wading method NWPHYD006 - Measure and process medium and high flows using a range of methods and equipment[§]	NWPHYD011 - Measure and process low and medium flows using area velocity methods [Superseded]
CC3: Ratings			NWPHYD003 - Develop and maintain ratings	NWPHYD017 - Develop and maintain ratings [Superseded]
CC4: Site operations	NWPHYD008 Operate, maintain and decommission monitoring sites	NWPHYD008 - Operate, maintain and decommission monitoring sites	NWPHYD008 - Operate, maintain and decommission monitoring sites[**]	NWPHYD013 - Operate, maintain and decommission monitoring sites [Superseded]
CC5: GW field tasks		NWPCAD022 Coordinate and monitor groundwater system usage	MSS025021 - Collect and evaluate groundwater data NWPCAD022 Coordinate and monitor groundwater system usage	
CC6: WQ field tasks	AHCLPW313 Undertake sampling and testing of water	AHCLPW313 - Undertake sampling and testing of water	AHCLPW313 - Undertake sampling and testing of water	AHCLPW306 - Undertake sampling and testing of water [Superseded]
CC7: Instrumentation			TLIX4027 - Assess maintenance spares and manage repairable items	
CC8: Survey		NWPHYD009 - Undertake surveying of monitoring sites	NWPHYD009 - Undertake surveying of monitoring sites	NWPHYD015 - Undertake surveying of monitoring sites [Superseded]
CC9: Applied Hydraulics			NWPHYD002 - Apply principles of open channel hydraulics	NWPHYD001 - Apply principles of open channel hydraulics [Superseded]

[§] This unit is from MSS50218 Diploma of Environmental Monitoring and Technology
[**] This unit is imported from NWP40120 Cert IV in Water Industry Operations

AHA Subject	Skill Set NWPSS00013*	Cert IV NWP40120*	Diploma NWP50118	Other qualifications
Elective Competencies				
EC1: Met data			MSS024007 - Collect and evaluate meteorological data	
EC2: Project management			BSBPMG522 - Undertake project work	LGAWORK503A - Undertake project investigation [Not considered suitable]
EC3: Technical Report writing			BSBWRT411 - Write complex documents	
EC4: Manage hydrographic survey			NWPHYS004 - Manage hydrographic surveying projects	
EC5: Financial management			BSBFIM501 - Manage budgets and financial plans	
Speciality Competencies				
SC1: Data Management				
SC2: Surface Velocity Measurement				
SC3: Metering				NWPGEN018 Apply environmental and licensing procedures of the water industry[††] NWPIWS006 Maintain meters for rural water supplies[‡‡]
SC4: Telemetry				
SC5: Hydraulic Modelling				
SC6: Management			BSBMGT502 Manage people performance BSBMGT516 Facilitate continuous improvement BSBMGT517 Manage operational plan BSBPMG522 Undertake project work	

[††] This unit taught by IAL, is from NWP20119 Certificate II in Water Industry Operations
[‡‡] This unit taught by IAL, is from NWP30219 Certificate III in Water Industry Operations

AHA Subject	Skill Set NWPSS00013*	Cert IV NWP40120*	Diploma NWP50118	Other qualifications
SC7: Hydrographic Surveying			NWPHYS001 Identify and analyse information technology for hydrographic surveys NWPHYS002 Interpret and analyse science principles for hydrographic surveying NWPHYS003 Manage and analyse water levels and flows NWPHYS004 Manage hydrographic surveying projects NWPHYS005 Use alternate positioning systems to gather data NWPHYS006 Use remote sensing for hydrographic surveying NWPHYS007 Use underwater acoustics to map waterways	
SC8: Instrument Management				
SC9: Flood site operations				

Colour code for units:

Skill Set NWP NWPSS00013, Diploma NWP50118 and Cert IV NWP40120 Units	LILAC = CORE (mandatory) unit
Diploma NWP50118 and Cert IV NWP40120 Units	MAGENTA = Hydrometric monitoring elective unit
Diploma NWP50118 and Cert IV NWP40120 Units	YELLOW OCHRE = Other elective unit from Diploma of Water Industry Operations
Superseded Diploma NWP50715 Units	GREEN
Cert IV Unit	BLUE = Unit imported from Cert IV qualification
Other qualifications	PALE YELLOW = Unit that that is part of another qualification

2.3. Proposed AHA Certification System

2.3.1 Proposed Certification requirements

The proposed system retains the same three certification levels, but modifies the requirements to achieve and retain certification.

To **BECOME** certified a person must:

- Be employed in a hydrometric practical or management role (at agreed number of days per week, based on the level).
- Be a member of AHA in good standing

Certified Cadet Hydrographer (CCH)

- Person has completed training (and assessment) in EIGHT fundamental principles or core competencies
- CCH can last for a maximum of three years

Certified Associate Hydrographer (CAH)

- Satisfactorily completed training and assessment in TWELVE fundamental principles and FOUR core competencies OR achieve Recognition of Current Competency (RCC) by completing assessment
- CAH can last indefinitely

Certified Practising Hydrographer (CPH)

- Satisfactorily complete training and assessment for ALL DEFINED core and supplementary competencies OR achieve Recognition of Current Competency (RCC) by completing assessment
- CPH can last indefinitely

It also adds an alternate SPECIALITY career path:

Certified Practising Specialist (CPS—speciality)

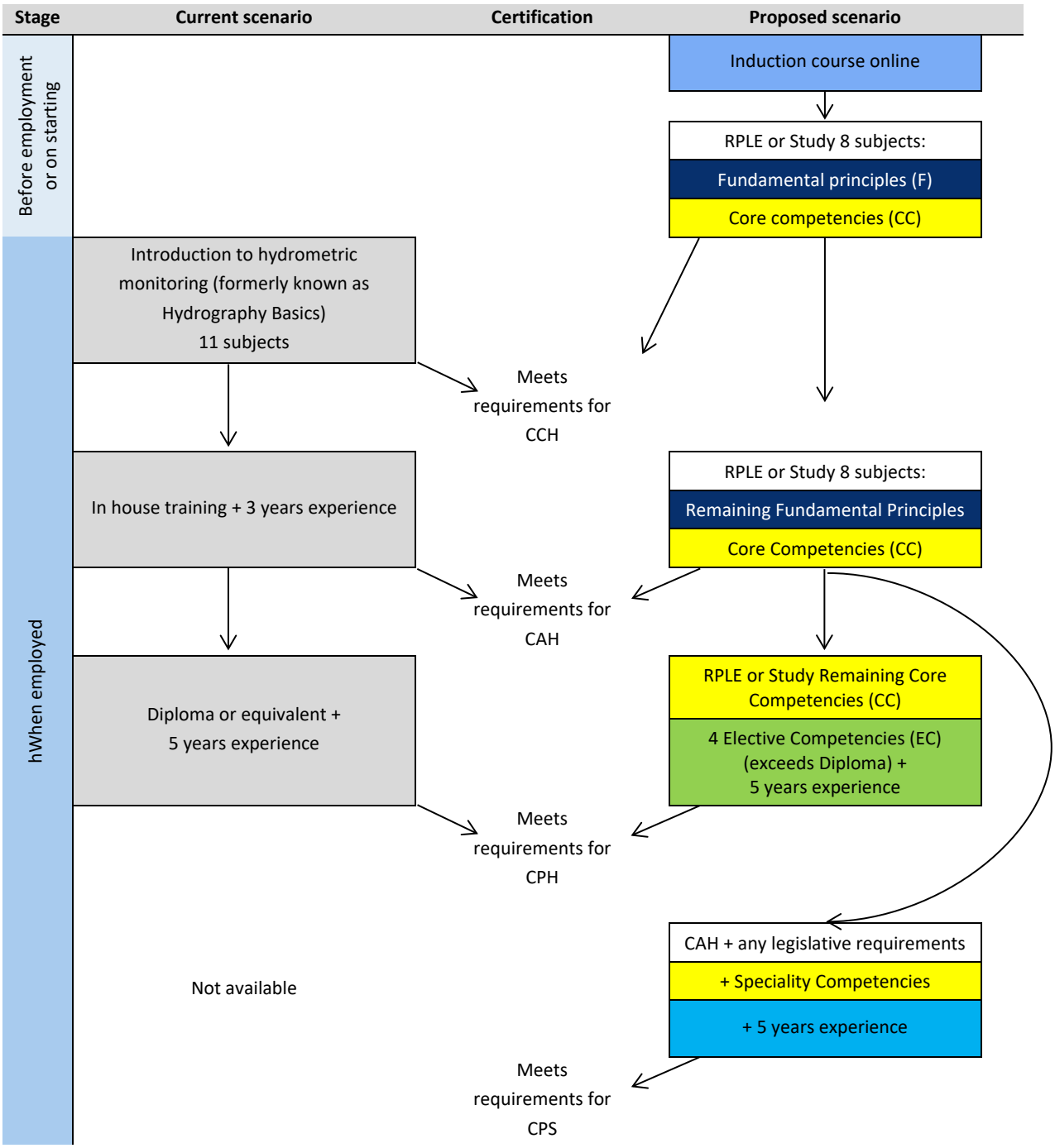
- Meets requirements of Associate
- Meets any legislative requirements for the speciality
- Complete training and assessment in speciality OR show an identified speciality skill set at a particular level
- NOTE: Could include areas such as meter installation, instrument technician, data management speciality

(Certified Practising Specialist) is included in the AHA road map for professional development, for use when there is an immediate need to certify certain people).

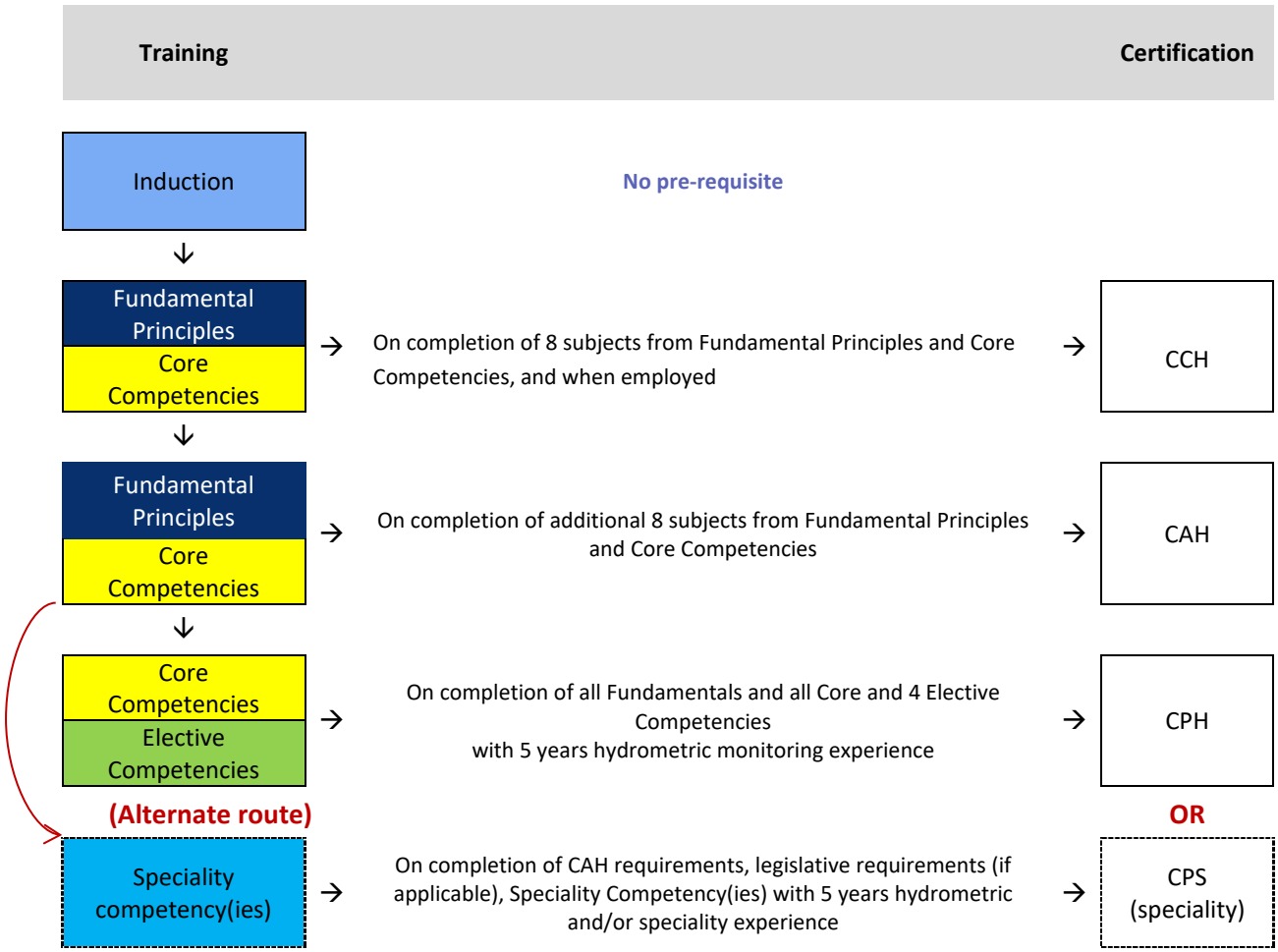
To **MAINTAIN** certification, a person must

- Be employed in a hydrometric practical or management role (at agreed number of days per week, based on the level).
- Be a member of AHA in good standing
- Provide evidence of Continuing Professional Development (CPD).
    - For CCH, undertakes training each year to meet the requirements of Associate level within three years
    - For CAH, complete an AHA identified competency (or a written report each year providing evidence of CPD)
    - For CPH and CPS, provide a written report each year providing evidence of CPD

2.3.2 Mapping of current and proposed scenarios



2.4. Mapping between Training and Certification



Appendix

This appendix gives an idea of the content that may be included in AHA subjects. It shows

- **a summary of some of the topics envisaged**
- **National Industry Guidelines that will be covered in the subject**
- **Units of Competency to be considered whether they should be included in the subject**

A.1. Induction

IC1.1 Hydrological cycle

- Understanding the cycle
- Define the elements in the cycle covered in the AHA Governance Plan

IC1.2 Terminology

- What: water level, hydrometry, etc.
- Why: data use, etc., basis for hydrology and water management
- What: is a hydrographer

IC1.3 Equipment

- What
- Why
- How

IC1.4 Work Environment

- Video link of different activities

IC1.5 Principles and Competencies

- List of principles and competencies and simply explained.

Includes knowledge and understanding of National Industry Guideline

- NI GL 100.00–2019 Glossary

A.2. Fundamental Principles

F1. Resource monitoring

- Includes:
  - including National Industry Guideline: NI GL 100.01–2019 Primary Measured Data
  - could include the requirements for Unit *NWPHYD004 Plan water resource management*
    - Review and plan hydrometric data management processes
    - Guarantee the provision of quality data
    - Manage water resources

F2. Statistics and uncertainty

- Includes:
  - knowledge of elementary statistics and basic techniques to analyse data
  - introductory knowledge of the concepts of uncertainty in measurement[8]
  - could include the requirements for unit FSKNUM27 - Collect, organise and interpret statistical data for work
    - Prepare to undertake a work related statistical investigation
    - Undertake statistical investigation using discrete data
    - Extract and interpret information from statistical investigation

F3. Spatial information

- Includes:
  - TO BE DETERMINED
  - could include the requirements for Unit CPPSIS4022 Plan water resource management
    - Prepare spatial data for storage
    - Access and retrieve spatial data
    - Manage spatial data security
  - could include the requirements for Unit *CPPSIS5040 Interpret and collate spatial data*
    - Access spatial data
    - Query and interpret spatial data
    - Collate spatial data
    - Validate spatial data

[8] https://en.wikipedia.org/wiki/Metrology#Uncertainty

F4. Hydrometric data and applications

- Includes:
  - knowledge of the nature of hydrometric data including:
    - river stage, flow, gaugings, ratings
    - water quality discrete sample data
    - water quality continuous monitoring data
    - groundwater level, flow, water quality data, both discrete measurement and continuous monitoring
    - meteorological data including rainfall (discrete and continuous – e.g. tipping bucket rain gauge), temperature, wind, evaporation, etc.
  - Broad knowledge of National Industry Guidelines:
    - NI GL 100.01–2019 Primary Measured Data
    - NI GL 101.00–2016 Water quality metadata
  - Content TO BE DETERMINED

F5. Meteorology and the water cycle

- Includes:
  - content based on *Introduction to Meteorology* delivered by BOM (https://bmtc.moodle.com.au/course/view.php?id=130) including:
    - Basic principles of atmospheric science and weather forecasting
    - Major systems which influence the weather
    - The broad range of weather and warning services delivered by the Bureau of Meteorology, and how you can use these to make better, more informed decisions
    - Cost AU$997 in 2019

F6. Principles of Hydraulics

- Includes:
  - Rivers and pipes, open and closed
  - Basic hydraulics
  - part of the requirements for Unit *NWPHYD002 - Apply principles of open channel hydraulics*
    - Select open channel hydraulic methodology
    - Collect and review data for flow calculations
    - Select the appropriate control structure
    - Calculate flow in open channels
    - Calculate flow from pressure measurements

F7. Groundwater basics

- Includes:
  - bores, piezometers, wells, groundtanks, monitoring, aquifers, surface water interaction

- possible content available from National Centre for Groundwater Research and Training (supported by many AHA employers): http://www.groundwater.com.au/pages/course-portfolio:
  - **Groundwater Essentials**: The one-day course is designed for non-specialists who require a basic understanding of the role of groundwater, and an overview of the types of aquifers common to the area. (http://www.groundwater.com.au/pages/groundwater-essentials) delivered by *National Centre for Groundwater Research and Training*
  - **Getting to Know Groundwater**: two-day course is designed for non-specialists who require an introduction to groundwater and an overview of the types of aquifers in Australia. The course will incorporate groundwater basics, quality and storage, an introduction to modelling, management options, conservation and remediation. (http://www.groundwater.com.au/pages/getting-to-know-groundwater) delivered by *National Centre for Groundwater Research and Training*
- possible inclusion of some or all requirements for Unit *NWPIRR004 Develop and review a groundwater plan*
  - Prepare for groundwater management
  - Develop the groundwater plan
  - Review and refine the groundwater plan

F8. Water quality

- Includes:
  - Hydrographers must be aware of *Australian & New Zealand Guidelines for fresh & Marine Water quality* http://www.waterquality.gov.au/anz-guidelines
  - Possible content available Maybeck and Helmer 1992. *An introduction to water quality*. UNESCO/WHO/UNEP http://www.who.int/water_sanitation_health/resourcesquality/wqachapter1.pdf?ua=1
  - possibly include the requirements of Skill Set *NWPSS00008 Water quality monitoring* which includes these units:
    - NWPGEN003 Apply environmental and licensing procedures of the water industry
    - NWPGEN004 Assess, implement and report environmental procedures
    - NWPGEN005 Coordinate and monitor the application of environmental plans and procedures
    - NWPGEN006 Implement and manage environmental management policies

F9. Electronics

- Includes:
  - Could include all or part of various units from UEE21911 Certificate II in Electronics
    - UEENEEA101A Assemble electronic components
    - UEENEEA102A Select electronic components for assembly
    - UEENEEA106A Use lead-free soldering techniques
    - UEENEED101A Use computer applications relevant to a workplace
    - UEENEEE038B Participate in development and follow a personal competency development plan
    - UEENEEE101A Apply Occupational Health and Safety regulations, codes and practices in the workplace
    - UEENEEE102A Fabricate, assemble and dismantle utilities industry components
    - UEENEEE104A Solve problems in d.c. circuits
    - UEENEEE105A Fix and secure electrotechnology equipment
    - UEENEEE123A Solve basic problems electronic and digital equipment and circuits
    - UEENEEE137A Document and apply measures to control OHS risks associated with electrotechnology work
    - UEENEEE141A Use of routine equipment/plant/technologies in an energy sector environment
    - UEENEEH102A Repairs basic electronic apparatus faults by replacement of components
    - UEENEEH169A Solve problems in basic electronic circuits
    - UEENEEK142A Apply environmentally and sustainable procedures in the energy sector
    - UEENEEP024A Attach cords and plugs to electrical equipment for connection to a single phase 230 Volt supply
  - Requirements to be determined after consultation with industry

F10. Regulation / legislation (provide Legal framework nationally and in each jurisdiction)

- Includes:
  - knowledge of *Water Act 2007 (Cwlth)*
  - knowledge of relevant state/territory water management act
  - requirements for Unit *NWPGEN016 Interpret and comply with regulatory requirements*
    - Research relevant water industry regulatory requirements
    - Implement and communicate policies and procedures for regulatory compliance
    - Maintain organisational records

F11. Health and Safety

- Includes:
  - Knowledge of relevant WHS legislation in each jurisdiction
  - requirements for Unit *TLIF4014 Develop and maintain a safe workplace*
    - Plan and implement safety requirements
    - Inform and train personnel on WHS/OHS legislation, codes and standards
    - Establish and maintain procedures for assessing and controlling safety risks

F12. Customer requirements and quality management

- Includes:
  - Knowledge of ISO9001 quality management systems standard
  - organisation business plan and client requirements
  - requirements for Unit BSBPMG411 - Apply project quality management techniques
    - Contribute to project quality planning
    - Apply quality policies and procedures
    - Contribute to project continuous improvement process

A.3. Competencies

A.3.1 Core

CC1. Hydrometric data

- Includes:
  - meteorological, continuous (aka time series), water quality (discrete and continuous), groundwater (discrete and continuous) data
  - knowledge and understanding of National Industry Guidelines:
  - NI GL 100.01–2019 Primary Measured Data
  - NI GL 100.05–2019 Data Editing, Estimation and Management
  - NI GL 101.00–2016 Water quality metadata
  - includes the requirements for Unit *NWPHYD005 - Process and report hydrographic time series data*
    - Prepare for collection of data
    - Retrieve time series data
    - Verify hydrometric data
    - Prepare reports
  - includes the requirements for unit MSS025019 - Report environmental data
    - Perform scientific calculations
    - Determine variation or uncertainty in data distributions
    - Read and interpret data and related statistics
    - Check for aberrant data sets
    - Report data and analysis

CC2. Gaugings

- Includes
  - gauging surface water streams and sewers using
    - Doppler velocity meter
    - acoustic Doppler current profiler
    - electromagnetic current meter
    - mechanical current meter
  - gauging medium and high flows using
    - area slope method
    - dilution gauging
    - float gauging
    - area velocity method
  - knowledge and understanding of National Industry Guidelines:
    - NI GL 100.04–2019 Gauging (stationary velocity-area method)
    - NI GL 100.08–2019 Application of Acoustic Doppler Current Profilers to Measure Discharge in Open Channels
    - NI GL 100.09–2019 Application of in-situ Point Acoustic Doppler Velocity Meters for Determining Velocity in Open Channels
    - NI GL 100.10–2019 Application of Point Acoustic Doppler Velocity Meters for Determining Discharge in Open Channels
  - requirements for Unit *NWPHYD007* - *Measure discharge using wading method*
  - requirements for Unit *NWPHYD006* - Measure and process medium and high flows using a range of methods and equipment

CC3. Ratings

- Includes:
  - knowledge and understanding of National Industry Guideline:
    - NI GL 100.06–2019 Stream discharge relationship development and maintenance
  - requirements for Unit *NWPHYD003* - *Develop and maintain ratings*

CC4. Hydrometric site operations

- **Site operations** [CORE]

  Includes:

  - all aspects of managing a hydrometric site including site selection, maintenance, equipment installation
  - knowledge and understanding of National Industry Guideline:
    - NI GL 100.02–2019 Site establishment and operations
  - requirements for Unit *NWPHYD008 Operate, maintain and decommission monitoring sites* (Cert IV NWP40120) [9]

CC5. Groundwater monitoring

- Includes
  - level measurement by manual methods, instrumentation of groundwater works, management of groundwater monitoring sites, purging and sample collection
  - knowledge and understanding of groundwater issues in National Industry Guideline:
    - NI GL 100.02–2019 Site Establishment and Operations
  - requirements for Unit *MSS025021 Collect and evaluate groundwater data*
    - Confirm groundwater data requirements with supervisor
    - Prepare for groundwater sampling and monitoring
    - Establish a well or bore for monitoring purposes
    - Conduct representative sampling of groundwater
    - Conduct field testing of groundwater
    - Process and interpret groundwater data
    - Maintain a safe work environment

CC6. Water quality monitoring

- Includes
  - sample location selection, WQ sampling collection and preservation, field sample analysis, in situ WQ monitoring (single sample sensors and real-time installed sensor and monitor,
  - knowledge and understanding of National Industry Guideline:
    - NI GL 101.00–2016 Water quality metadata
  - requirements for *Unit AHCLPW313 Undertake sampling and testing of water*
  - requirements for *Unit AHCLPW306 Undertake sampling and testing of water (superseded)*
    - Plan for sampling and testing field work
    - Prepare equipment and resources
    - Carry out sampling and testing of water
    - Complete water sampling and testing activities

[9] This unit is part of Cert IV and can be imported to the Diploma

CC7. Instrumentation

- Includes
  - aspects of instrument management needed by field hydrographers, including instrument management, calibration and validation, record keeping
  - knowledge and understanding of National Industry Guideline:
    - NI GL 100.03–2019 Instrument and measurement systems management
  - requirements for Unit TLIX4027 - *Assess maintenance spares and manage repairable items*)
    - Perform spares assessment activities
    - Manage repairable items
    - Maintain records

CC8. Surveying of monitoring sites

- Includes
  - knowledge and understanding of survey issues in National Industry Guideline:
    - NI GL 100.02–2019 Site Establishment and Operations
  - requirements for Unit *NWPHYD009 - Undertake surveying of monitoring sites*
    - Plan and assess survey requirements
    - Operate survey equipment
    - Select and survey monitoring sites
    - Document survey and data results

CC9. Applied Hydraulics

- Includes:
  - Rivers and pipes, open and closed
  - Applied hydraulics
  - part of the requirements for Unit *NWPHYD002 - Apply principles of open channel hydraulics*
    - Select open channel hydraulic methodology
    - Collect and review data for flow calculations
    - Select the appropriate control structure
    - Calculate flow in open channels
    - Calculate flow from pressure measurements

A.3.2 Elective

EC1. Meteorological data

- Includes
  - Requirements of *MSS024007 Collect and evaluate meteorological data*
    - Prepare for field work
    - Perform basic meteorological measurements
    - Verify meteorological data
    - Interpret and apply meteorological information
    - Report data and finalise documentation

EC2. Project Management

- Includes
  - Understand principles of project management and design and complete a project
  - Requirements of *BSBPMG522 - Undertake project work*
    - Define project
    - Develop project plan
    - Administer and monitor project
    - Finalise project
    - Review project

EC3. Technical Report Writing

- Includes
  - skills required to prepare technical reports
  - Requirements of *BSBWRT411 - Write complex documents*
    - Plan documents
    - Draft text
    - Prepare final text
    - Produce document

EC4. Manage hydrographic surveying

- Includes
  - Requirements of *NWPHYS004 - Manage hydrographic surveying projects*
    - Plan hydrographic survey projects
    - Conduct hydrographic surveying
    - Produce hydrographic survey documentation
    - Apply legislation and international convention

EC5. Financial management

- Includes
  - Requirements of BSBFIM501 - Manage budgets and financial plans
    - Plan financial management approaches
    - Implement financial management approaches
    - Monitor and control finances
    - Review and evaluate financial management processes

A.3.3 Speciality

SC1. Data Management

- Includes:
  - Training to expert level in data transfer (including telemetry) and data management applications in use by the employer
  - Expert knowledge and understanding of National Industry Guidelines:
    - NI GL 100.01–2019 Primary Measured Data
    - NI GL 100.05–2019 Data Editing, Estimation and Management
    - NI GL 101.00–2016 Water quality metadata
  - Expert knowledge of Bureau of Meteorology standard Water Data Transfer Format
  - Formal data management training TO BE DETERMINED

SC2. Surface Velocity Measurement

- Includes:
  - monitoring with Drones, Radar & Remote Sensing
  - TO BE DETERMINED

SC3. Metering (open channel)

- Includes
  - Legislation, documentation and open channel methodology
  - Course for NSW (now available)
  - Further requirements to be determined after consultation with Irrigation Australia and state agencies
  - May include Units (delivered by Irrigation Australia Ltd):
    NWPGEN003 Apply the environmental and licensing procedures of the water industry
    NWPIRR022 Maintain meters for rural water supplies

SC4. Telemetry

- Includes:
  - knowledge and understanding of
    - short-haul radio comms,
    - mobile comms (3G,4G,5G)
      IOT radio comms (NB-iot, CatM1, Lorawan etc)
      satellite constellations and communications
      AS WELL AS some cloud based data handling platforms which is an ever changing space.

SC5. Hydraulic Modelling (HEC-RAS)

- Includes:
  - **TO BE DETERMINED**

SC6. Management

- Includes:
  - Technical Report Writing, Financial Management, HR management, Project Management
- May include Units such as
  - BSBMGT502 Manage people performance
    BSBMGT516 Facilitate continuous improvement
    BSBMGT517 Manage operational plan
    BSBPMG522 Undertake project work)

SC7. Hydrographic Surveying

- Includes
  - Requirements for Hydrographic Surveying speciality in Diploma 50118 which requires a student to complete 4 out of 7 listed speciality elective units
  - Could select from 7 speciality Units
    NWPHYS001 Identify and analyse information technology for hydrographic surveys
    NWPHYS002 Interpret and analyse science principles for hydrographic surveying
    NWPHYS003 Manage and analyse water levels and flows
    NWPHYS004 Manage hydrographic surveying projects
    NWPHYS005 Use alternate positioning systems to gather data
    NWPHYS006 Use remote sensing for hydrographic surveying
    NWPHYS007 Use underwater acoustics to map waterways

SC8. Instrumentation Management

- Includes:
  - technical knowledge
  - planning and prioritising skills
  - project management
  - **TO BE DETERMINED**

SC9. Flood site operations

- Includes:
  - **TO BE DETERMINED**