The purpose of the paper is to provide industry stakeholders with a summary of the key findings from the recent industry intelligence gathering activities overseen by the Water Industry Reference Committee (IRC). The key findings will be used by the IRC in the development of the Water IRC Skills Forecast and Proposed Schedule of Work for the NWP National Water Training Package.

Several targeted strategies were employed to collect industry intelligence about the opportunities and challenges for the Water workforce and any NWP National Water Training Package review work necessary to meet these industry needs. These included:

- A Call for Submissions process inviting stakeholder responses about key issues affecting skills and workforce development;
- An IRC Skills Forecast Survey seeking information on priority skill needs, skill shortages and issues relating to workforce training and;
- A comprehensive review of Data and Research Sources nominated by the Water IRC.

Australian Industry Standards has been tasked by the IRC to collect feedback from interested stakeholders about these issues on its behalf.
HOW TO PROVIDE FEEDBACK

Stakeholders are invited to submit their comments on the findings outlined in this paper by close of business on 20 February 2018.

It is acknowledged that the information provided about issues in this paper is deliberately brief. The purpose of this paper is to validate and confirm the findings, which will inform the advice the Water Industry Reference Committee (IRC) will provide to the Australian Industry and Research Committee (AISC).

In considering the key issues and themes identified in this paper, we are keen to have any feedback that either confirms your issue has been covered, or else raises an issue you feel should be addressed in the Proposed Schedule of Work (FY18/19–FY21/22) for the NWP National Water Training Package to be submitted to the AISC on 30 April 2018.

Responses can be emailed to enquiries@australianindustrystandards.org.au.

For further information please contact:

Klausch Schmidt
Industry Manager
P (03) 9604 7223
M 0417 568 967
WATER INDUSTRY OVERVIEW

The Water industry in Australia has an estimated annual revenue of $22.71 billion, adding $13.06 billion to the Australian economy in 2015-16. The industry employs over 31,000 people across its sub-sectors: water supply, sewerage, drainage services and pipeline transport (water).

KEY WATER METRICS

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue ($b)</td>
<td>22.71</td>
</tr>
<tr>
<td>Profit ($b)</td>
<td>5.23</td>
</tr>
<tr>
<td>Average Wage ($)</td>
<td>99,952.77</td>
</tr>
<tr>
<td>No of Businesses</td>
<td>795</td>
</tr>
<tr>
<td>Employment Growth to 2023 (%)</td>
<td>3.9</td>
</tr>
</tbody>
</table>

Scope: Sewerage and Drainage Services, Water Supply

KEY WATER FACTS

76,544 gigalitres (GL) of water extracted for use in the Australia economy 2016-17

Over 10,000 GL used for supply and distribution to industry and households

Over 60,000 GL in non-consumption uses (e.g. hydroelectricity generation)

On average, every GL consumed produces $108 million of economic output

Over 820 dams in Australia Highest per-capita surface water storage capacity in the world

Over 575 GL supplied annually across Australia, costing $1-4 per kilolitre to produce

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3 Australian Water Association (no date) Large dam fact sheet.
4 Australian Water Association (no date) Desalination fact sheet.
WATER WORKFORCE

WATER WORKFORCE BY STATE/TERRITORY

<table>
<thead>
<tr>
<th>State/Territory</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Victoria</td>
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<tr>
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<td>Australian Capital Territory</td>
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<td>Northern Territory</td>
<td>135</td>
</tr>
</tbody>
</table>

Source: Australian Bureau of Statistics (2017), 2016 Census - Employment, Income and Education

WATER SKILL SHORTAGES

85.4 per cent of employers reported experiencing a skills shortage in the last 12 months. The occupations reported as being in shortage were:

1. Water/Wastewater Treatment Operators
2. Educators
3. Engineers (various)
4. Managers (various)
5. SCADA programmers

Reasons for Shortage

Employers identified the following reasons for the shortage with the most frequent response listed first.

1. Ageing workforce / current staff retiring
2. Wages / salaries considered too low
3. Geographic location of the vacancy
4. Competition from other organisations
5. Cost/time to achieve the required qualification
KEY WATER SKILL ISSUES

INDUSTRY CHALLENGES AND OPPORTUNITIES

Technological Innovation
Industries worldwide are experiencing rapid change in their daily operations, accelerated by technological innovation. These changes can transform the way industries manage, supply, and regulate their assets. Within the Water industry, technological innovation is enabling innovative approaches to water systems and asset management. These will have far-reaching effects, changing the way water is delivered to highly urbanised regions, commercial zones, and rural locations.

Automation
The use of advanced autonomous systems and modelling, including Geographic-Information Systems (GIS) and machine learning, have had a positive effect on the Water industry. These technologies have enabled water supply, treatment and infrastructure maintenance companies with methods to improve their operations. These include detecting leaks in network supply pipes, defective sewer systems, sewer choke points, and automated waste-water treatment processing.

By utilising automated processes water companies can identify areas of required preventative maintenance. This reduces the cost, demand, and pressures associated with reactive maintenance\(^5\).

The onset of automation in water operations and delivery is anticipated to have a significant impact on the industry and the skill requirements of the workforce. Retraining and up-skilling will be needed to ensure the workforce can keep relevant with new technologies, maintain asset management, and improve water utility efficiency\(^6\).

Drones and Remote Surveying
The use of drones and remote surveying devices are already making a significant impact in the Water industry. These systems have changed the way waterways and water assets are monitored and managed. Their use in the industry is highly effective in providing accurate location-based repair sites, substantially reducing occupational health and safety concerns related to the risk posed by manual inspections of elevated and high-risk assets\(^7\). These new systems and remote operations require highly specialised skills to monitor, diagnose, and interpret system data of faults and areas of investigation.

The Internet of Things
The advent of the Internet of Things, the ever-increasingly miniaturised sensors and internet connected devices, will greatly alter the way water is managed. As this technology becomes embedded in the Water industry, and as the roll-out of the ‘smart-network’ develops, emphasis will be placed on Intelligent Water Metering (automatic metering, data management, network transmission), higher-resolution data points (enabling increased accuracy of water management), and operations.

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Catchment management solutions are requiring new approaches to manage water supply effectively and accurately. Increasingly, workers are required to interact with new technological devices and operating systems. Data capture and remote system operations via tablets and smart phones is increasing at water treatment plants and in the field when assessing network issues.

On this basis, digital literacy will be important for the Water industry as they seek appropriately trained staff to work with new technologies. These technological changes will increase the demand for specialist skills; including data analysis and data literacy, network security, and higher-order skills incorporating creative, critical thinking, problem-solving, and inter-personal communication skills, in the workforce. The industry will need to be able to adapt, and provide support to the existing workforce, by upskilling and retraining, to maximise productivity.

Big Data

Big Data, the ever-increasingly large volume of data being captured by sensors and subject to analysis, is further transforming the management of water assets and supply in Australia\(^8\). Examples include the collection of data from pumping stations (including energy use), water treatment plants, sewage plants, and reservoirs to manage operations remotely. This information is also highly valuable for research and planning. Analysing real-time demand will provide opportunities to increase performance and will aid efficiencies by diagnosing and reducing faults and waste/leakage along the network.

The use of Big Data will enable the advanced systems to assist with real-time operations, decision-making, and provide improved customer service relationships, providing accurate water usage statistics over time to customers. It will also be used to optimise the urban and rural water services, settings, and safety management systems.

Infrastructure Demands and Asset Management

The Water industry is highly reliant on infrastructure, which requires ongoing maintenance and renewal. Given the dependency on aging infrastructure and increasing urbanisation, new challenges are anticipated to emerge. Water supply management, quality control, and compliance will present complications that must be addressed.

The ongoing development of new water infrastructure, maintenance and upkeep has implications for the workforce. Companies are seeking appropriately skilled labour and management skills for these projects.

Water security and the implementation of new approaches such as Integrated Urban Water Management (IUWM) and Water Sensitive Urban Design (WSUD), are also areas of interest to provide reliability to supply and manage water assets in high-density urbanised areas\(^9,10\).

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Alternative Water Supply

With increasing demand for water, the industry is investigating new means to supply water from alternative sources. Applications for alternative sources include recycled water, seawater desalination, stormwater harvesting, greywater, and waste-water systems. Regulatory frameworks have been developed to ensure these treatment methods meet the safety requirements of drinking water quality. However, not every state and territory have a consistent approach to validate the technologies employed\(^{11}\). Developing unified approaches to these standards will enable a skilled workforce that is able to deliver services in states and territories, irrespective of the location of training.

Climate Change / Sustainable Management

Water catchments are under pressure for maintaining sustainable water supply due to the impacts of climate change. A survey conducted by Deloitte and the Australian Water Association in 2014 revealed over 86 per cent of respondents identified climate change as a risk to water management\(^{12}\).

The impacts of climate change are already being felt within Australia. Rainfall variability is beginning to place increasing pressure on all facets of the Water industry. These effects will have long-lasting and negative impacts on the industry, requiring proactive management of water resources.

To ensure a stable and reliable supply of water across all of Australia, the Water industry will have to proactively manage water resources. New systems will need to be utilised to ensure water resources are monitored in real-time, forecasted and consistently available, irrespective of the challenges presented. The industry acknowledges the critical impact of climate change and drought and is revising water demand models, focussing on assets and solution-based strategies to mitigate these issues\(^{13,14}\).

An industry-led focus on the planning, development and forecasting of skills will help ensure the skill needs of the workforce are meet the demands and challenges anticipated in the future.

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WORKFORCE SUPPLY SIDE CHALLENGES AND OPPORTUNITIES

Regulatory Changes
Federal and state governments have increased the regulation and reporting requirements for water utilities. These changes ensure the delivery of reliable water to the public while minimising the effects on the surrounding environment. This has a flow on effect to operational staff that are required to attain certification to operate, document and make decisions in an increasingly regulated environment. Regulatory harmonisation across states/territories should be worked towards, ensuring the safe handling of water resources in a consistent approach nation-wide.

Ageing Workforce
The Water industry of Australia has a large proportion (36 per cent) of its workforce aged over 50 and subsequently due to retire in the next 10-15 years\(^\text{15}\). Attraction and recruitment of new employees, that can be mentored by experienced staff, will help companies to retain industry knowledge as people leave the industry.

The pace of technological change, and the capacity for the existing older workforce to adopt the new technologies, are a challenge for the Industry. Workforce planning requires the need to balance employing the younger generation with technological skills, while ensuring accumulated corporate knowledge of the more experienced Water industry workforce is maintained.

Water companies may need to look at how they promote careers in the industry, particularly in entry level roles, where there is a high turnover. Making the industry an attractive and rewarding place to work is needed to further secure the viability of the industry.

Workplace and Gender Diversity
The current workforce gender composition is approximately 25 per cent female, decreasing from 30 per cent in 2011\(^\text{16}\). Workplace cultural changes can also encourage the workforce to enhance the learning and work experience, thereby providing wide-ranging skills and outlooks\(^\text{17}\). Overall, increased performance can be achieved with gender and cultural diversity across all entry points, including management positions. Furthermore, enhancing gender equality may assist with future shortages in the workforce that will arise from generational shifts\(^\text{18}\).


\(^{17}\) Australian Water Association (2016) Cultural diversity key to strengthening water businesses.

International / National Workplace Trends

New technology in the water industry is the major trend affecting the workforce. The digitalisation of operations to improve services delivered corresponds with a need to increase the digital skills available in the workplace. The incorporation of drone technology, system operations, and other digital innovations has altered the methods used to oversee water assets; thereby having an impact on risk management policies. As these technologies continue to thrive in the industry, it will be necessary to prepare the workforce accordingly.
PRIORITY SKILLS
The priority skills results are drawn from Water stakeholder responses to the IRC Skills Forecast survey conducted between 4 December 2017 and 16 January 2018.

SKILL CATEGORY
In order of priority to the industry, the following skills were identified as the most important for the Water workforce within the next three to five years.
1. Treatment/Processing
2. Operational
3. Maintenance/Servicing
4. Digital
5. SCADA Programming

GENERIC SKILLS
Ranking of the 12 generic workforce skills in order of importance to the Water industry.
1. Technology
2. Science, Technology, Engineering, Mathematics (STEM)
3. Design mindset / Thinking critically / System thinking / Solving problems
4. Managerial / Leadership
5. Data analysis
6. Customer service / Marketing
7. Learning agility / Information literacy / Intellectual autonomy and self-management
8. Language, Literacy and Numeracy (LLN)
9. Environmental and Sustainability
10. Communication / Virtual collaboration / Social intelligence
11. Financial
12. Entrepreneurial
BACKGROUND INFORMATION

INDUSTRY REFERENCE COMMITTEES

New arrangements for training product development commenced in January 2016. These arrangements consider the needs of employers of all sizes, across all industry sectors, and ensure the delivery of high quality Training Packages that are nationally endorsed and internationally regarded.

Industry References Committees (IRCs):

- Provide a forum for industry engagement
- Direct the review, development and implementation of Training Package content relevant to the industry sectors they cover
- Act as a conduit for industry feedback to the Australian Industry and Skills Committee (AISC) and governments on industry trends

IRCs are composed of individuals and industry members with the experience, skills and knowledge of their specific industry sector. IRCs are supported by independent and professional Skills Service Organisations (SSO) to develop and review Training Packages, and to inform Training Package development priorities.

IRCs have a direct relationship with the AISC, and are charged with identifying industry’s skills needs, developing Business Cases setting out the Case for Change, and providing the sign off on training products before they go to the AISC for consideration.

Each IRC will perform the following functions:

- Gather intelligence for their industry sectors to inform advice on Training Package development and review
- Direct the work of its SSO in the development of industry proposals, Cases for Change and Cases for Endorsement
- Oversight the development and review of Training Packages in line with the requirements of the AISC
- Provide sign off for industry proposals, Cases for Change, Cases for Endorsement and other submissions for consideration by the AISC
- Direct the work of the SSO in preparing the support materials where funding for additional activities is provided
- Report to the AISC on progress of its work
- Promote the use of Vocational Education and Training (VET) in the sectors they represent
WATER INDUSTRY REFERENCE COMMITTEE (IRC)

The Water Industry Reference Committee (IRC) has been assigned responsibility for the NWP National Water Training Package.

**Chair:** John Harris

**Deputy Chair:** George Wall


The NWP National Water Training Package provides the only nationally recognised Vocational Education and Training (VET) qualifications for occupations involved in water industry operations (generalist, treatment, networks, source, irrigation, hydrography, trade waste), treatment (drinking water, waste water) and irrigation. The NWP National Water Training Package comprises 7 qualifications, 10 Skill Sets, and 148 Units of Competency and associated assessment requirements and covers water supply, sewerage, drainage services and pipeline transport (water). The NWP National Water Training Package is in the Scope of Registration of 28 Registered Training Organisations.

IRC SKILLS FORECAST AND PROPOSED SCHEDULE OF WORK

The IRC Skills Forecasts focus on the prioritisation of the skill needs of the industry sectors each IRC has responsibility for. They are developed and reviewed annually in consultation with industry stakeholders and submitted on behalf of the IRC to the Australian Industry and Skills Committee (AISC) for approval.

IRCs are required to consult broadly with stakeholders to ensure a whole-of-industry view about the opportunities and challenges for the workforce and the Training Package review work necessary to meet industry needs.

The IRC Skills Forecast is submitted to the AISC and informs the development of a four-year rolling National Schedule for Training Package development and review work. More information on the National Schedule can be found at www.aisc.net.au/content/national-schedule.
Australian Industry Standards (AIS) provides high-quality, professional secretariat services to the Water IRC in our role as a Skills Service Organisation. AIS provides services to eleven allocated IRCs which cover Aviation, Corrections, Gas, Electricity Supply (Generation and Transmission, Distribution and Rail), Electrotechnology, Maritime, Public Safety (including Police, Fire and Emergency Services, Defence), Rail, Transport and Logistics, and Water industries. AIS supports these important industry sectors using our world class in-house capability and capacity in technical writing, quality assurance, project management and industry engagement in the production of Training Packages.

AIS was established in early 2016, 20 years after its predecessor the Transport and Logistics Industry Skills Council (TLISC) was established in 1996. More information about AIS can be found at http://www.australianindustrystandards.org.au.

- We support industry growth and productivity through our modern innovative approach to establishing skills standards.
- We provide high-quality, professional secretariat services to help our allocated industry reference committees develop the skills that industry needs.
- We partner with industry to shape the workforce of the future.