CIVIL CONTRACTORS FEDERATION TAS LTD

Civil Construction Industry Workforce Plan 2019-2025

Tasmanian Government

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Foreword

The CCF recognises both the Federal and State Government's support for their commitment to increase Infrastructure spend across Tasmania.

The Civil Construction Industry plays an important role in delivering building and maintaining infrastructure to benefit all Tasmania. As an industry we employ 2,000 people across the State in 270 businesses, both large and small. We are critical to other industries including construction, engineering, transport, agriculture and mining, and deliver the backbone to Tasmania's road and bridges.

Infrastructure Tasmania have produced a document - *Tasmanian Infrastructure Project Pipeline* which indicates a significant increase in construction activity over the next 10 years. This has put our industry under pressure, and highlights gaps in our skills and capabilities.

This workforce development plan plays an important role in defining our needs, our challenges and opportunities. Our industry provides a great range of careers starting at school and working right through to university level positions. Employment opportunities that are spread right across the State from our rural areas to metropolitan regions.

This plan will require industry, government and education coming together to deliver an achievable pathway for the civil sectors and enterprises to engage in effective workforce development strategies and workforce planning activities. The joint commitment by the Civil Contractors Federation Tasmania and other stakeholders will assist the industry to grow its future workforce.

I acknowledge the dedication of the steering committee who assisted in the delivery of this plan and specifically thank Skills Tasmania for their funding support.

Hugh Maslin
President
Civil Contractors Federation Tasmania Ltd

Executive Summary

The civil construction industry plays a critical role in the development and maintenance of Tasmanian Infrastructure. The industry is made up of around 260 businesses, 94% of whom are small. It currently employs an estimate of just under 2,000 people who occupy a range of roles from managerial and para professional to plant operators and labourers. The workforce is 92% male is ageing and experiences a range of challenges recruiting employees with sufficient industry context and experience.

In 2018, the State Government released the Tasmanian Infrastructure Project Pipeline (TIPP) that provides a consolidated list of all the key projects that are underway or planned over the next ten years. This Workforce Development Plan is written within the context of the employment and skills needs of the projects outlined in the TIPP. From an occupational perspective, the Industry will require (+/- 30%) approximately 1,000 additional workers over the next 10 years to meet growth projections and accommodate attrition and loss of workers due to retirement.

The key challenges in meeting these forecasts and preparing the industry for the future are:

1. attracting new people to the industry
2. lack of diversity across the industry which adds to lack of attractiveness.
3. lumpy workload – every operator noted the lack of surety of workload as the biggest workforce challenge
4. issues related to an ageing workforce
5. significant experience and industry context shortfalls across all occupations
6. recruitment difficulties with plant operators and para professionals
7. poor training culture and a 'ticket/ compliance' focus
8. lack of specificity of training supply many operators noted that there was too much generic training leading to specific skills needing to be developed on the job
9. significant red tape accessing training and taking on apprentices
10. meeting a future horizon of data analytics and optimising big data.

Responsibility for skills development lies primarily at the enterprise level; however, with industry support, the Civil Contractors Federation plays a critical role in leading initiatives that tackle these challenges and support the ongoing development of the industry so that it, in turn, can support the development of Tasmania's infrastructure.

Over-riding the recommendations and actions outlined in this report is the need to establish a workforce development steering group to oversee and coordinate the implementation of this plan. The industry is serviced by all three levels of education, straddles both the infrastructure, skills and regulatory layers of Government and has clear connections with the construction industry and engineering profession.

This report aims to produce an agreed and authoritative:

- understanding of the labour and skills needs of the Tasmanian Civil Construction sector
- road map of practical and actionable strategies to help meet those needs
- structure to implement this plan.

To assist with this aim, a draft version of this report was presented and validated at a Civil Construction Roundtable hosted by the Deputy Premier and Minister for Skills, Jeremy Rockliff and attended by 38 industry representatives (see appendix).

The key findings and actions are shown 'at a glance' below:

Current sector	Future needs	Current support/ supply	Gaps	Actions
1,550 people 260 businesses 94% small businesses	New entrants required across all occupations – greatest need is for plant operators and para professionals	Disparity between skills and experience required by industry and market availability	Plant operators Para professionals	Establish industry wide workforce development steering group including Engineers Australia, TBCITB, education sectors, Government – infrastructure and skills Explore Group training to stimulate apprentice activity
Major business challenge is lumpy workload	Surety of work and strategies to mitigate effect	Tasmanian Infrastructure Pipeline	Delays and lack of confidence in major infrastructure roll out	
Supported by all three levels of education	Increased pathways into the industry Improved coordination of training and skills development Para professional pathways	Pathway programs at school level, apprenticeships, large volume of generic training	Insufficient industry engagement with existing programs and lack of specialist skills	Establish industry wide program to increase engagement with education pathways
Mature industry highly reliant on Government infrastructure spending with ageing workforce	Support for issues relating to an ageing workforce	Initiatives at enterprise level	Collective activity to ensure skills and knowledge base not lost	Establish an industry workforce capability development program
8% Female – mostly in administrative roles	More diversity to fill gaps and enhance attractiveness	Perception of unattractive industry – recruitment issues	Migrants Women	Explore opportunities for increased effort - Industry wide promotional campaign
Experience gaps across all occupations particularly plant operators and para professionals	Improved coordination of training and skills development	Large volume of generic training	Lack of mechanism to assess interstate workers to gain licenses to work Insufficient industry context	Onsite assessment for interstate workers moving to Tasmania
Para professionals – supervisors, estimators, surveyors challenging	Digital/ GPS Data analytics Quality Assurance Supervision	Lack of training	Contract and project management Supervision and project handover Surveying Asset management Digital/ GPS	Training brokerage – support skill development opportunities to fill gaps
Majority of training is compliance focused	Stronger workforce development culture	Training too generic Too much red tape	Support for smaller operators	Establish training calendar

The Civil Construction Roundtable placed the following recommendations in priority order:

1. governance arrangements be established in partnership with Engineers Australia and involving relevant education, industry and government stakeholders (Skills and Infrastructure) to steer the implementation of this workforce development plan.
2. support be provided for a dedicated resource to drive the actions arising from this Plan
3. to develop and deliver a specific program of skills development for existing paraprofessionals. This program should cover digital technologies, quality assurance, onsite supervision, contract and project management
4. support be provided to assist industry to increase engagement with school based and apprenticeship pathways. This should include an industry wide career attraction program be developed to rebrand the industry as one with great career prospects
5. an industry wide training calendar – the aim of this service is to provide CCF members with a calendar of upcoming training opportunities that accommodates fluctuating demand for the industry's services
6. develop and deliver a fast track project management course
7. providing onsite assessment for compliance purposes – the aim of this service would be to facilitate recognition of operator skills to assist interstate and migrant workers to enter the Tasmanian industry. This would assist with the recruitment of new plant operators into the industry
8. the Civil Contractors Federation consider establishing services to offer:

a. training brokerage – the aim of this service would be to aggregate industry requirements and facilitate training offering to meet this demand. Areas identified as in demand:
    i. continuing professional development opportunities, particularly those that support the passing and transferring of skills onto others such as a mentoring program
    ii. to develop a general onsite induction program for TIPP projects
b. providing a group training service – the aim of this service would be to stimulate apprenticeship (both trade and higher level) activity and could be delivered through a partnership or establishment of a new service.
c. facilitating a small business workforce capability development service – the aim of this service is to support businesses to improve their workforce planning and development capability.

Introduction

This Plan sets the workforce development and planning priorities for and commitments from the Civil Construction industry for the next five years. It was developed for the Civil Contractors Federation (CCF) whose members are responsible for the construction and maintenance of Australia's infrastructure, including roads, bridges, pipelines, drainage, ports and utilities. This Plan was funded by Skills Tasmania and coordinated and facilitated by The Work Lab.

This workforce development plan sits within the CCF's national infrastructure priorities of:

1. reforming skills development and training[1]
2. protecting and enhancing the viability of civil industry businesses
3. increasing infrastructure investment and funding
4. ensuring an efficient, equitable and competitive procurement
5. enhancing industrial relations.

The goal of this Workforce Plan is to develop and implement a practical and actionable civil construction industry workforce development plan (the Plan) that builds off existing data and information and drives a culture of engagement in training and workforce planning in the sector.

If successful, this will ensure that the Tasmanian civil construction industry has the capacity to deliver projects in the government and private sectors valued at around $6.5 billion and $4.1 billion respectively.[2]

The Civil Construction industry in Tasmania is a critical linkage in Tasmania's economic and infrastructure development and it is important that the sector maintains sufficient and appropriate levels of skilled workers across all streams of employment.

With the release of the 10-year Tasmanian Infrastructure Project Pipeline[3], the Civil Construction Industry Workforce Plan is considered within the context of the employment and skills needs of the projected projects. Delivering the required numbers to meet this plan will need careful management by industry and sets the strategic context of this report.

It is estimated that Tasmania has a small civil construction workforce of about 1,500. For this report, we separated these numbers to provide analysis at 5 key industry functions, which cover:

- managers
- professionals
- administrators
- plant operators
- onsite construction workers (labourers).

Previous workforce plans for the civil sector note difficulties in determining accurate data. For example, Tasmanian Building Construction Industry Training Board (TBCITB) suggests that the industry is comprised of about 10 large businesses, 30-50 medium sized businesses and about 200 micro-sized

[1] Constructing Australia, Industry's Infrastructure Priorities, CCF, 2019 "Announce an immediate review into funding levels and distribution arrangements to VET providers including registered training organisations to ensure Australia has a sufficient and sustainable civil construction industry workforce to meet the pipeline of infrastructure investment over the next 10 years."
[2] Ministerial Priorities for Training and Workforce Development 2018-21, pp. 18, 20
[3] Tasmanian Infrastructure Project Pipeline, Tasmanian Government, July 2018

businesses. The CCF Tas estimates that there are approximately 260 civil construction businesses in Tasmania. Approximately 240 (94%) of these would employ 5 or fewer employees (including owner driver/operator and not including interstate businesses). Australian Bureau of Statistics data differs again. Due to these data inadequacies, all available data sets have been used in the modelling and variances between sets are used to determine the sensitivity of the forecast numbers.

The scope of this Workforce Plan

The key sectors targeted in this Plan are defined by the Tasmanian Infrastructure Plan as:

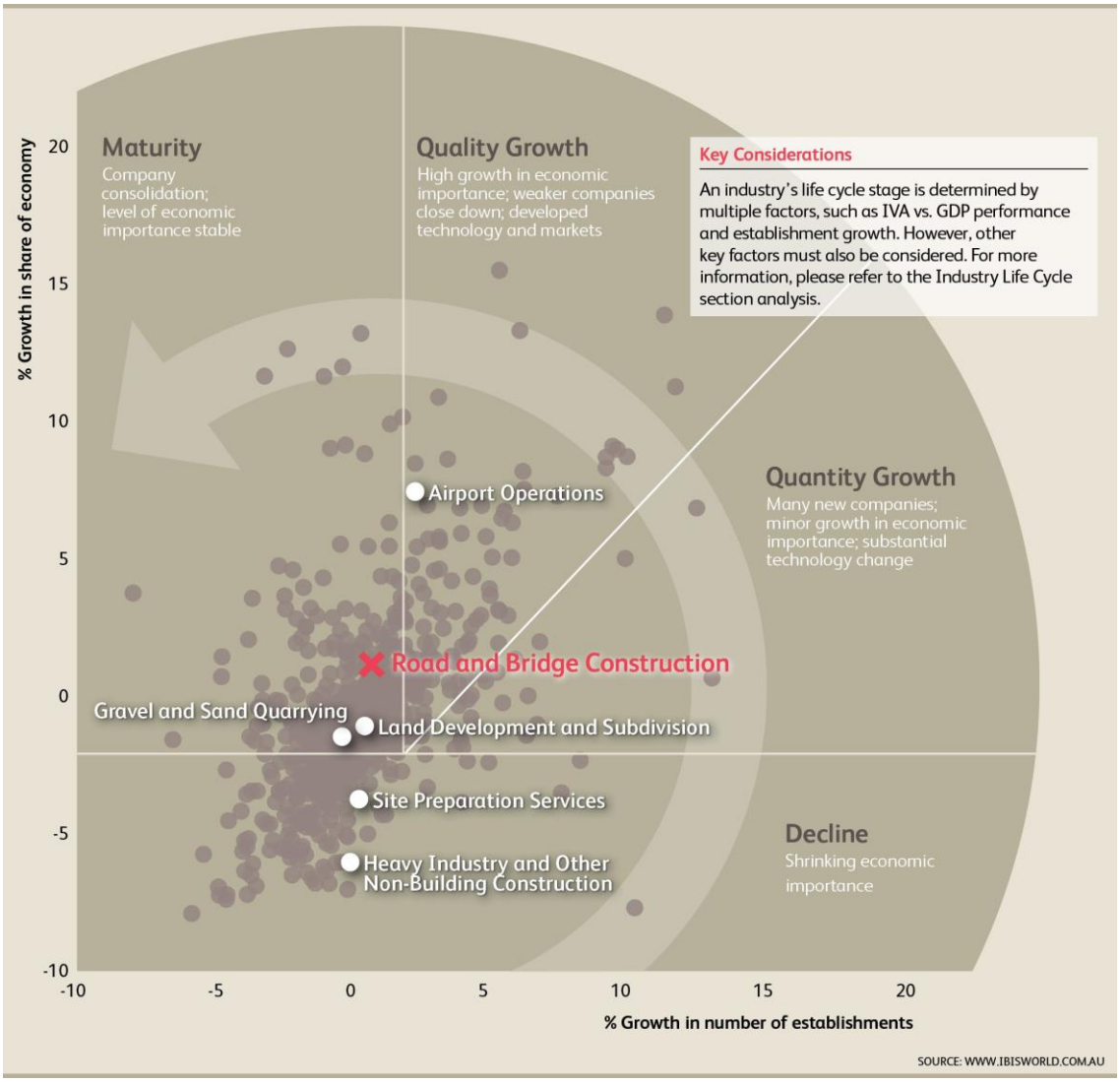
- Roads
- Energy
- Water, Sewerage and Stormwater
- Airports
- Ports
- Irrigation
- Rail
- Communications
- Housing, Health, Education and Justice.

The Plan includes skill sets covering professional and technical skills, and ongoing continuous professional development. The key vocational streams included are:

- general compliance
- technology
- plant operations
- civil skills
- supervision
- engineering
- management.

Context

The Civil Construction Industry is mature, highly reliant on infrastructure spending by the public and private sectors and is relatively slow growing. IBIS World provide a comparative analysis of most sectors of the Australian economy[4] and positions the Civil Infrastructure sector in a mature market characterised by business consolidation, and economic stability, in terms of GDP output.



These macro characteristics are drivers of four trends shaping the sector over the medium to long term:

1. **Industry growth opportunities**: Growth in the sector is largely dependent on infrastructure projects driving demand for civil infrastructure skills. Infrastructure has become a national priority in Australia, with an increased emphasis on renewing and updating the country's infrastructure creating a solid pipeline of large scale projects in civil infrastructure.[5] The TBCITB notes that civil contractors are mainly companies that operate across Tasmania with some doing work

[4] Ibis World Report E3101 Road and Bridge Construction in Australia, March 2019
[5] Infrastructure Australia (February 2016) Australian Infrastructure Plan: Priorities and reforms for our nation's future.

interstate and overseas.[6] A small number of national companies operate in the State, but predominantly the Tasmanian market is serviced by Tasmanian companies. Interstate issues are considered of lesser relevance to the Tasmanian civil sector but are discussed in the appendix.

2. **Environmental issues**: Management of the environmental footprint impacts on all construction projects requiring the promotion of environmental sustainability in every aspect of business operations.

3. **Technological change**: With the increasing sophistication of software programs and integration with automated technology, technological change will continue to affect all industries including the civil sector. Innovative practices and new technologies and technology driven growth will be important for the current workforce, creating new job opportunities for those in roles currently at risk of automation.

   Compared to other sectors of the Australian economy, the sector has historically been a sector of comparatively low innovation.[7] The rapid emergence of drone technology, digital engineering, 3D printing and automated manufacturing is also changing the way the construction sub-sector is operating. Building Information Modelling (BIM), has already gained widespread endorsement in Australia. BIM allows construction workers to view a digital representation of a project, from planning, through to construction and operation, serving as a central platform of collaboration for all stakeholders. As more information can be fed into a BIM system, such as through drone technology and laser mapping, greater levels of monitoring and control can be delivered to the worksite. In 2016, Infrastructure Australia recommended that BIM be mandatory for all large scale, complex infrastructure projects.[8] In 2019 the Queensland Government mandated BIM for all public construction projects over $20 million.

   Automation is likely to replace jobs in mobile plant operation and machine operation in the next 20 years, leading to a need for retraining to support employees to move into other areas if they are to remain in the sector on a long term basis.[9] However, during this transition, there is a need for employers to balance maintaining the technical understanding gained through practical experience, with equipping workers with the skills to operate in an increasingly technology-focused environment.

4. **Evolving business pressures**: The major business pressures affecting the sector are:
   - focus on efficiency of production rather than expansion
   - increasing competition
   - increased focus on safety and compliance
   - an ageing workforce.

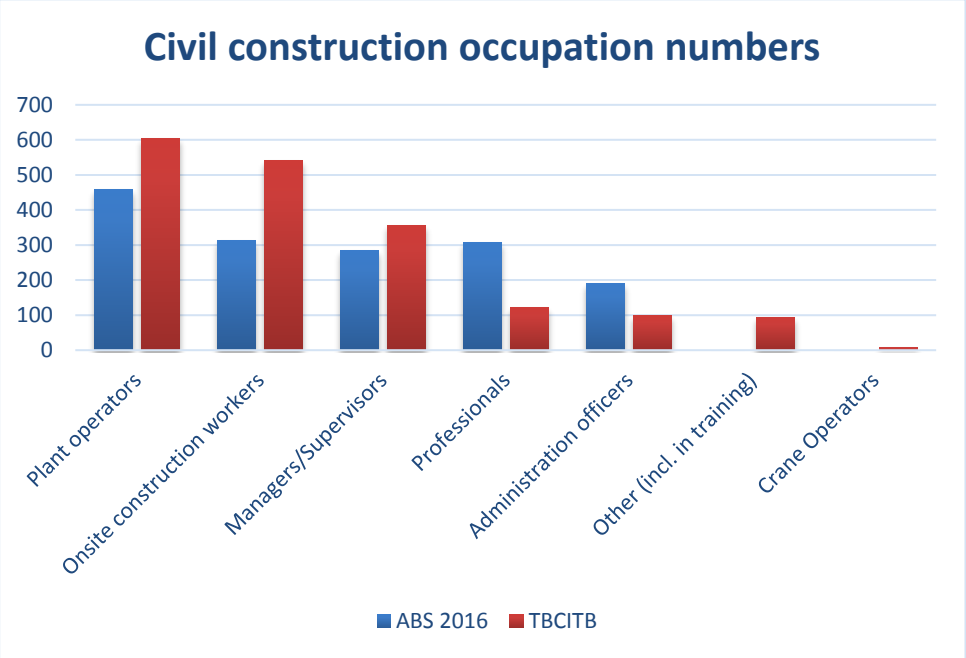
[6] Results of the survey of civil construction businesses 2018, TBCITB 2018
[7] Australian Bureau of Statistics (2016) 81660DO002_201415 Summary of IT Use and Innovation in Australian Business, 2014-15.
[8] Infrastructure Australia (February 2016) Australian Infrastructure Plan – Priorities and Reforms for Our Nation's Future
[9] PwC (2015) A Smart Move page 10

These 'big picture' issues influence all operators in the local industry, with consultations noting challenges relating to lumpy workload (growth and stalling of activity), environmental sustainability, technological change and evolving business pressures.

The Tasmanian Workforce

The 2016 ABS census data reports an industry of 1,555 workers[10], in comparison a recent report by the TBCITB[11] reports numbers of 1,825. These workers are spread across the occupational groups from managerial positions, paraprofessionals, plant operators to labourers. Its workforce skills needs are therefore diverse and span the vocational and higher education sectors.

Figure 1: Occupational spread of the Tasmanian Civil Construction Industry



The TBCITB[12] notes that:

- the civil construction workforce is made up mainly of onsite workers (engineers, supervisors, plant operators and other onsite workers – about 80%)
- female workers comprise 8% of their workforce, predominantly in administrative roles. There is an unmet labour pool available by attracting more women into the industry
- Trainees are about 1% of the workers in their respective corresponding occupations. This rate is significantly below average industry attrition levels of 5% and ageing workforce estimates
- About 30% of managers, supervisors and plant operators are over 55. Some 8% of this cohort are expected to retire within the next two years. The civil workforce is ageing with significant levels of retirement predicted over the next decade. This presents a challenge for the industry as a whole to ensure the knowledge and experience is passed on, while also training workers

[10] There are no detailed public figures available in relation to the size of the civil construction workforce as a separate and discrete workforce and so specific data sets have been sourced from the Australian Bureau of Statistics but come with some caveats due to small sample sizes. These data correlate census data with expenditure by industry sectors scoped within the Plan.

[11] Results of the survey of civil construction businesses 2018, TBCITB 2018

[12] Results of the survey of civil construction businesses 2018, TBCITB 2018

in the new skills they will need for the future. The sector needs to prepare for this loss of skills and experience and plan training now to avoid shortages in the future.

70% of the workforce is accounted for within 30 occupations, geographically spread across the state as shown in Error! Reference source not found.[13].

Table 1: Top 30 occupations by region, by area of work[14]

		Region				
Area	**Number of occupations**	**601 Hobart**	**602 Launceston and North East**	**603 South East**	**604 West and North West**	**Total * (region numbers)**
Managers	8	88	37	14	28	167
Professionals	7	63	54	19	67	203
Administrators	4	39	21	0	32	92
Plant operators	8	129	111	54	95	389
Labourers	3	78	53	37	63	231
Total	30	397	276	124	285	1,082*

* Total excludes number of occupations column.

[13] Australian Bureau of Statistics, 2019, customised report

[14] A complete table, including numbers by region and industry, can be found in Appendix 3.

As the occupation spread suggests, the skills needs of the industry are very diverse. The tasks associated with the key occupations are shown in **Table 2**.

Table 2 Tasks performed by key occupations

Area	Occupation	Task
Managers	133111 Construction Project Manager	interpreting architectural drawings and specifications
		coordinating labour resources, and procurement and delivery of materials, plant and equipment
		consulting with Architects, Engineering Professionals and other professionals, and Technical and Trades Workers
		negotiating with building owners, property developers and subcontractors involved in the construction process to ensure projects are completed on time and within budget
		preparing tenders and contract bids
		operating and implementing coordinated work programs for sites
		ensuring adherence to building legislation and standards of performance, quality, cost and safety
		arranging submission of plans to local authorities
		building under contract, or subcontracting specialised building services
		overseeing the standard and progress of subcontractors' work
		arranging building inspections by local authorities
Professionals	312112 Building Associate	assisting Construction Managers, Architects and Surveyors in planning and organisation
		interpreting plans, regulations and codes of practice
		preparing preliminary sketches, working drawings and specifications
		preparing, editing and revising plans, maps, charts and drawings
		coordinating works programs
		inspecting work and materials for compliance with specifications, regulations and standards
		calculating costs and estimating time scales
		collecting data using surveying instruments and equipment
		performing routine computations and plotting preliminary data
Administrators	531111 General Clerk	recording, preparing, sorting, classifying and filing information
		sorting, opening and sending mail
		photocopying and faxing documents
		preparing reports of a routine nature
		recording issue of equipment to staff
		receiving letters and telephone messages
		transcribing information onto computers, and proofreading and correcting copy
		may provide customers with information about services
		may perform receptionist duties
		recording, preparing, sorting, classifying and filing information
Plant operators	721000 Mobile Plant Operators	driving plant to worksite
		driving and maneuvering plant on site
		selecting and fitting attachments to plant
		manipulating controls to operate attachments mechanically, hydraulically and electrically, and to move materials
		monitoring operation of plant directly and by referring to instruments
		monitoring condition of plant, performing minor repairs and reporting mechanical faults
	721211 Earthmoving Plant Operator (General)	preparing and positioning plant for operation
		selecting, fitting and removing attachments such as buckets, winches, loading scoops, shovel blades and rock breaking hammers
		operating controls to excavate, break, drill, level, compact, gouge out, move, load and spread earth, rock, rubble, soil and other materials
		monitoring operation of plant and adjusting controls to regulate pressure, speed and flow of operation, and ensuring safety of other workers
		raising, lowering and manipulating attachments using manual and hydraulic controls
		working from drawings, markers and verbal instructions
		servicing, lubricating, cleaning and refueling plant and performing minor adjustments and repairs
	721214 Excavator Operator	preparing and positioning plant for operation
		selecting, fitting and removing attachments such as buckets, winches, loading scoops, shovel blades and rock breaking hammers
		operating controls to excavate, break, drill, level, compact, gouge out, move, load and spread earth, rock, rubble, soil and other materials
		monitoring operation of plant and adjusting controls to regulate pressure, speed and flow of operation, and ensuring safety of other workers
		raising, lowering and manipulating attachments using manual and hydraulic controls
		working from drawings, markers and verbal instructions
		servicing, lubricating, cleaning and refueling plant and performing minor adjustments and repairs
	733111 Truck Driver (General)	maneuvering vehicles into position for loading and unloading
		loading and unloading vehicles using lifting and tipping devices
		observing safety requirements when loading and unloading vehicles
		making regular quality checks of vehicles to ensure they can be driven safely
		estimating weights to comply with load limitations and ensuring safe distribution of weight

		ensuring goods are stowed and securely covered to prevent loss and damage
		verifying loading documents, checking condition of goods and obtaining certification of deliveries
Labourers	821111 Builder's Labourer	loading and unloading building and construction materials, tools and equipment and transporting them around building sites
		erecting and dismantling temporary structures such as barricades and scaffolding
		mixing, pouring and spreading materials such as concrete, plaster and mortar
		cleaning and carrying out minor repairs on stormwater drains and canals, and checking for cracks and leaks in sewerage systems
		digging holes and shoveling excavated material onto conveyors, wheelbarrows and trucks for removal
		spreading and levelling soil, gravel and sand on roads and driveways, trench bottoms and similar locations
		assisting with assembling and installing piping, valves and fittings
		assisting with installing fixtures
	821511 Paving and Surfacing Labourer	sweeping paving bases prior to laying asphalt and other surfaces
		sprinkling and brushing hot and cold-mix asphalt over surfaces to be paved and repaired to bond asphalt toppings to bases
		operating tank-truck distributors and hoses to spray tar and road oils and emulsions on graded surfaces prior to paving
		tripping tail-gate levers to discharge hot-mix asphalt into paving machines, and spreading stone chips, gravel and cold-mix asphalt onto road surfaces
		shoveling asphalt mix into areas inaccessible to paving machines, and compacting mix using rakes and hand tampers
		cutting and trimming damaged surfaces using jack-hammers and softening edges of areas to be repaired with blowtorches
		erecting and dismantling barricades
		loading and unloading equipment, and cleaning work sites
		may direct traffic (with appropriate endorsements)

All three levels of education provide qualifications that are used by the civil construction sector. As indicated in **Table 3**, there are very few qualifications that are specific to civil construction and many occupations are 'covered' in a generic sense. This has a detrimental effect on the industry, creating a lack of perceived value of qualifications and a focus on 'tickets' required for compliance. It also creates a challenge for industry where context and specific knowledge is missing from new recruits and where undertaking further training or professional development is challenged by lumpy workload and 'red tape' associated with accessing funding for training.

Table 3: Occupations and their associated qualifications

Area	Occupational codes	Associated qualification(s)[15]
Managers	111111 Chief Executive or Managing Director 111211 Corporate General Manager 132211 Finance Manager 132311 Human Resource Manager 133111 Construction Project Manager 133112 Project Builder 133211 Engineering Manager	BSB80215: Graduate Diploma of Strategic Leadership BSB51918: Diploma of Leadership and Management FNS60217: Advanced Diploma of Accounting BSB50618: Diploma of Human Resources Management CPC60212: Advanced Diploma of Building and Construction (Management) CPC50210: Diploma of Building and Construction (Building) Degree in Civil Engineering
Paraprofessionals & Trades	221111 Accountant (General) 233211 Civil Engineer 251312 Occupational Health and Safety Adviser 312112 Building Associate 312212 Civil Engineering Technician 321211 Motor Mechanic (General) 322311 Metal Fabricator 322313 Welder (First Class) 323211 Fitter (General)	FNS50217: Diploma of Accounting RII50515: Diploma of Civil Construction Design BSB41415: Certificate IV in Work Health and Safety RII40615: Certificate IV in Civil Construction Operations RII50415: Diploma of Civil Construction Management MEM30305: Certificate III in Engineering - Fabrication Trade MEM50105: Diploma of Engineering - Advanced Trade MEM30205: Certificate III in Engineering - Mechanical Trade

[15] Note: qualifications become superseded or replaced by another on a regular basis. Where recent matches could not be found, alternative qualifications were input. Matches were kept to one result per one occupational group area code, however in practice codes may be mapped to more than one qualification.

Administrators	511111 Contract Administrator 511112 Program or Project Administrator 512111 Office Manager 531111 General Clerk 542111 Receptionist (General) 551111 Accounts Clerk 551211 Bookkeeper 551311 Payroll Clerk 611311 Sales Representative	CPC40208: Certificate IV in Building and Construction (Contract Administration) BSB41515: Certificate IV in Project Management Practice BSB42015: Certificate IV in Leadership and Management BSB30415: Certificate III in Business Administration BSB30115: Certificate III in Business BSB30415: Certificate III in Business Administration FNS30317: Certificate III in Accounts Administration BSB41715: Certificate IV in Recordkeeping FNS50417: Diploma of Payroll Services BSB30115: Certificate III in Business
Plant operators	721211 Earthmoving Plant Operator (General) 721214 Excavator Operator 721215 Grader Operator 721216 Loader Operator 733111 Truck Driver (General)	RII30815: Certificate III in Civil Construction Plant Operations RII30815: Certificate III in Civil Construction Plant Operations RII30815: Certificate III in Civil Construction Plant Operations RII30815: Certificate III in Civil Construction Plant Operations TLI31216: Certificate III in Driving Operations
Labourers	821111 Builder's Labourer 821211 Concreter 821511 Paving and Surfacing Labourer 899923 Road Traffic Controller 899999 Labourers	CPC20211: Certificate II in Construction Pathways CPC30318: Certificate III in Concreting RII30915: Certificate III in Civil Construction TLI42516: Certificate IV in Traffic Operations RII30915: Certificate III in Civil Construction

At the school level[16] there are a small number of programs designed to encourage pathways into the civil sector.

- 10 students are currently engaged in VET in Schools (where students complete a vocational qualification as part of their senior secondary certificate in year 11 and 12) at Bayview Secondary College in Hobart, undertaking RII20115 - Certificate II in Resources and Infrastructure Work Preparation delivered by TasTAFE
- Two students are undertaking an Australian School based Apprenticeship (ASbA) for the years 2018/19 (where students complete an apprenticeship part time as part of their secondary schooling):
    - 1 x RII30915 Certificate III in Civil Construction at Stornoway
    - 1 x RII20115 Certificate II in Resources and Infrastructure Work Preparation at West Tamar Council
- a further two students were also recorded as being in the ASbA program in 2017 for:
    - 2 x RII30915 Certificate III in Civil Construction at Stornoway
- A total of 42 students (across four colleges) are currently engaged in the Certificate II in engineering pathways.

The Department of Education is also engaging years 9-10 and relevant industries in their Packages of Learning pilot program for 2019. This program is aimed at providing students and teachers a "suite of curriculum resources which adopts an integrated approach to teach the core subjects of the Australian Curriculum (i.e. English, Maths, Science, History or Geography)".[17] Each Package of Learning is designed to align with one of the four growth industry areas in Tasmania, which are:

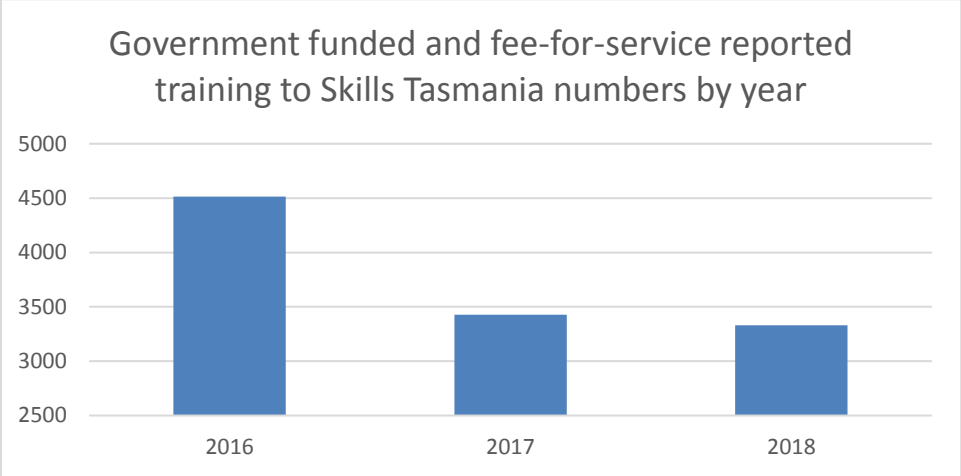
- Advanced Manufacturing
- Agriculture, Food and Natural Resources
- Architecture and Construction
- Hospitality and Tourism.

[16] Information provided by the Department of Education

[17] https://documentcentre.education.tas.gov.au/Documents/Packages-of-Learning-Schools-Fact-Sheet.pdf

At the vocational (VET) level Skills Tasmania data for enrolments in 2016 shows more than 4,500 people enrolled in courses which map to civil construction occupations (from **Table 3** above). The data also shows that between 2016 and 2018 there was a 26.2% drop in reported training numbers.

Figure 2: Training numbers in Civil related qualifications 2016 - 2018



As indicated in **Table 4** there are reasonable numbers in many of the 'generic' qualifications applicable to the industry but an absence of pathways supporting the paraprofessional layer.

Table 4: VET enrolment numbers in the major qualifications relevant to the industry

Qualification Code	Qualification Name	2016	2018
BSB30412	CERTIFICATE III IN BUSINESS ADMINISTRATION	31	
BSB30415	CERTIFICATE III IN BUSINESS ADMINISTRATION	242	207
BSB41415	CERTIFICATE IV IN WORK HEALTH AND SAFETY	183	161
BSB41513	CERTIFICATE IV IN PROJECT MANAGEMENT PRACTICE	31	
BSB41515	CERTIFICATE IV IN PROJECT MANAGEMENT PRACTICE	223	277
BSB41715	CERTIFICATE IV IN RECORDKEEPING	1	
BSB42015	CERTIFICATE IV IN LEADERSHIP AND MANAGEMENT	369	485
BSB50615	DIPLOMA OF HUMAN RESOURCES MANAGEMENT	53	27
BSB51915	DIPLOMA OF LEADERSHIP AND MANAGEMENT	675	636
BSB51918	DIPLOMA OF LEADERSHIP AND MANAGEMENT		1
CPC20211	CERTIFICATE II IN CONSTRUCTION PATHWAYS	13	
CPC30313	CERTIFICATE III IN CONCRETING	13	12
CPC50210	DIPLOMA OF BUILDING AND CONSTRUCTION (BUILDING)	73	50
FNS30315	CERTIFICATE III IN ACCOUNTS ADMINISTRATION	157	116
FNS50215	DIPLOMA OF ACCOUNTING	36	29
MEM30205	CERTIFICATE III IN ENGINEERING - MECHANICAL TRADE	244	147
MEM30305	CERTIFICATE III IN ENGINEERING - FABRICATION TRADE	298	350
RII30813	CERTIFICATE III IN CIVIL CONSTRUCTION PLANT OPERATIONS	1,202[18]	
RII30815	CERTIFICATE III IN CIVIL CONSTRUCTION PLANT OPERATIONS	176	238
TLI31210	CERTIFICATE III IN DRIVING OPERATIONS	156	
TLI31216	CERTIFICATE III IN DRIVING OPERATIONS		114
	Total	**4,514**	**3,330**

[18] Further detail on this figure is not available

Based on the above enrolment numbers, a projection has been made to show the difference between numbers in training and numbers in the workforce (that are mapped to the equivalent qualification). This data can be seen in **Table 5**. For example, the Diploma of Accounting had 36 enrolments in 2016, and 29 in 2018. This was a change in training of -19.4% (drop in enrolment numbers). However, the occupational change required another 7.6% of workers for the same years. Therefore, the training numbers of 2018 will need to rise 134% to cover the occupational role increase (in this case, equivalent to around 37 new enrolments). Of note is that these figures are based on all new entrants requiring training and certification although in practice many entrants are recruited into roles with existing skill sets and/or qualifications that do not directly match their role.

What is clear from this analysis (in **Table 5**) is that there is a mismatch between supply and demand, specifically:

- a void of paraprofessional level training for building associates and engineering technicians
- insufficient formal training pathways for new entrants.

Table 5 Training and employment number changes from 2016-2018

Role	Qualification	Training numbers 2016	Training numbers 2018	Training change	Occupation change	Forecast needed training numbers 2018	Forecast change needed
531111 General Clerk	CERTIFICATE III IN BUSINESS ADMINISTRATION	273	207	-24.2%	5.9%	289	140%
251312 Occupational Health and Safety Adviser	CERTIFICATE IV IN WORK HEALTH AND SAFETY	183	161	-12.0%	6.4%	195	121%
511112 Program or Project Administrator	CERTIFICATE IV IN PROJECT MANAGEMENT PRACTICE	254	277	9.1%	6.4%	270	98%
551211 Bookkeeper	CERTIFICATE IV IN RECORDKEEPING	1	0	-100.0%	7.8%	1	100%
512111 Office Manager	CERTIFICATE IV IN LEADERSHIP AND MANAGEMENT	369	485	31.4%	6.3%	392	81%
132311 Human Resource Manager	DIPLOMA OF HUMAN RESOURCES MANAGEMENT	53	27	-49.1%	6.9%	57	210%
111211 Corporate General Manager	DIPLOMA OF LEADERSHIP AND MANAGEMENT	675	637	-5.6%	6.9%	722	113%
821111 Builder's Labourer	CERTIFICATE II IN CONSTRUCTION PATHWAYS	13	0	-100.0%	5.4%	14	1300%
821211 Concreter	CERTIFICATE III IN CONCRETING	13	12	-7.7%	7.4%	14	116%
133112 Project Builder	DIPLOMA OF BUILDING AND CONSTRUCTION (BUILDING)	73	50	-31.5%	7.4%	78	157%
551111 Accounts Clerk	CERTIFICATE III IN ACCOUNTS ADMINISTRATION	157	116	-26.1%	6.5%	167	144%
221111 Accountant (General)	DIPLOMA OF ACCOUNTING	36	29	-19.4%	7.6%	39	134%
323211 Fitter (General)	CERTIFICATE III IN ENGINEERING - MECHANICAL TRADE	244	147	-39.8%	5.8%	258	176%
322311 Metal Fabricator	CERTIFICATE III IN ENGINEERING - FABRICATION TRADE	298	350	17.4%	6.1%	316	90%

721211 Earthmoving Plant Operator (General)	CERTIFICATE III IN CIVIL CONSTRUCTION PLANT OPERATIONS	1378	238	-82.7%	5.6%	1455	611%
733111 Truck Driver (General)	CERTIFICATE III IN DRIVING OPERATIONS	156	114	-26.9%	5.2%	164	144%
Overall averages				**-17.8%**	**6.5%**		**233%**
Weighted overall average change needed							**106%**

At the tertiary level the University of Tasmania (UTAS) provides a range of graduate programs of applicability to the civil industry. The data in Table 6 contains all students, domestic and international. At a macro level a decline in numbers in the engineering and related technologies is evident over the last three years. Engineering students specialise into civil engineering in the second semester of second year. UTAS data shows that out of 348 domestic students, 63 chose the civil engineering as their major in 2018. Table 6 shows the total number of enrolments in engineering and related technologies 2011-2017.

Table 6 Tertiary Data for Tasmania by broad field of education, 2011-17[19]

Year*	Institution	Natural and Physical Sciences	Information Technology	Engineering and Related Technologies	Architecture and Building	Agriculture, Environmental and Related Studies	Management and Commerce	Mixed Field Programs	Non-award courses	Total	All Student Enrolments
2011	University of Tasmania	1,786	1,649	1,528	511	415	4,531	647	104	11,171	23,944
2012	University of Tasmania	1,978	1,642	1,430	560	447	4,261	616	0	10,934	25,367
2013	University of Tasmania	1,976	1,485	1,498	529	470	4,660	844	0	11,462	26,783
2014	University of Tasmania	1,995	1,353	1,683	451	453	4,316	859	10	11,120	29,232
2015	University of Tasmania	1,943	1,341	1,736	409	478	5,898	602	57	12,464	32,149
2016	University of Tasmania	1,536	343	1,089	231	291	2,625	1,063	0	7,178	29,091
2017	University of Tasmania	1,533	360	987	192	392	1,852	827	0	6,143	31,161
Total		**12,747**	**8,173**	**9,951**	**2,883**	**2,946**	**28,143**	**5,458**	**171**	**69,373**	**197,727**

* The 2018 full year data was not available at the time of data collection.

Workforce priorities

During consultations with CCF members there was significant commonality in the issues forwarded as challenges they currently face in relation to their workforces:

- **attracting new people to the industry** – many operators described informal recruitment practices and always running 'a few guys short'. Very few operators

[19] https://www.education.gov.au/higher-education-statistics

were aware that apprenticeship pathways exist and those that did commented on it being outdated. A number noted that mandatory licencing would 'fix' the issue

- **lack of diversity across the industry** which adds to lack of attractiveness. The industry is heavily dominated by males and the small percentage of females in the industry (8%) are generally in administrative roles
- **poor training culture** and a 'ticket/ compliance' focus. All operators spoke of the compliance burden of their operations in relation to workplace health and safety, environmental and sustainability compliance etc and also the compliance nature of work related to being part of a supply chain to a head contractor or Government related agency. The dominance of compliance for operations has the effect of skewing the training market to delivering 'tickets' and creates an environment where capacity and performance development is beyond the horizon of many operators
- **significant red tape** accessing training and taking on apprentices. Many operators spoke of the funding for training support they receive from the TBCITB but noted that it is accompanied by the disincentive of form filling and red tape
- **lumpy workload**: every operator noted the lack of surety of workload as the biggest workforce challenge, making it difficult to invest in staff and plan for the longer term. Whilst a few noted that the Tasmanian Infrastructure Plan[20] provided some confidence they also pointed to delays and uncertainty in projects. Lumpy workload was also cited by a few as an opportunity to align training and professional development to coincide with down time
- **significant experience and industry context shortfalls** across all occupations. This issue was discussed by every operator and was described as being a problem with plant operators lacking specialist skills in e.g. irrigation as well as in paraprofessional occupations and functions relating to:
    - contract management
    - project management
    - project supervision and project handover
    - surveying/ asset management
- **recruitment difficulties for critical job roles:** organisations can cite unfilled vacancies for para professional and plant operator roles. It was noted at the Civil Construction Roundtable that the lack of project designers and estimators is holding back the smooth roll out of the TIPP, exacerbating the issue of lumpy workload
- **lack of specificity of training supply:** many operators noted that there was too much generic training leading to any specific skills needed to be developed on the job. A number also noted concerns that apprenticeship level training was out of date[21]
- issues related to an **ageing workforce**. All operators commented that their workforce was getting older and that they could see that this would be a problem in the future. There are multiple impacts relating to this:
    - an increased workload on employers to provide additional support to workers to transition to retirement
    - a heightened focus on knowledge management and ensuring that critical skills and knowledge are able to be passed on

[20] Tasmanian Infrastructure Project Pipeline, Tasmanian Government, July 2018

[21] The current qualification was released in 2015

    - a latent capacity of exiting employees to transfer their skills into training others
- **data analytics and big data**. Many of the larger operators spoke of the need to develop skills across the workforce in global positioning system (GPS) and its application to civil operations. TasWater in particular commented that 'big data' was on their skills horizon, but its exact application at this stage was not well articulated. As noted in earlier sections of this report, technological change will have an effect on the industry, with increased use of GPS, remote sensing of infrastructure and building information modelling. The application of these technologies and the resulting collation of advanced data will lead to skill requirements in data analysis and decision making.

Future Workforce Profile

In order to provide some context to the future needs of the industry, the Tasmanian Infrastructure Plan[22] (TIPP) has been reviewed to calculate workforce numbers expected to service the reported $13.3 billion dollars to be spent on projects across the state. The reported spend is shown in **Figure 3**. The (TIPP) report shows that in the years 2016-17 a little over $1.3bn was spent on social and economic projects.

The value of work done by the residential and non-residential building and engineering construction industries in 2016 was:

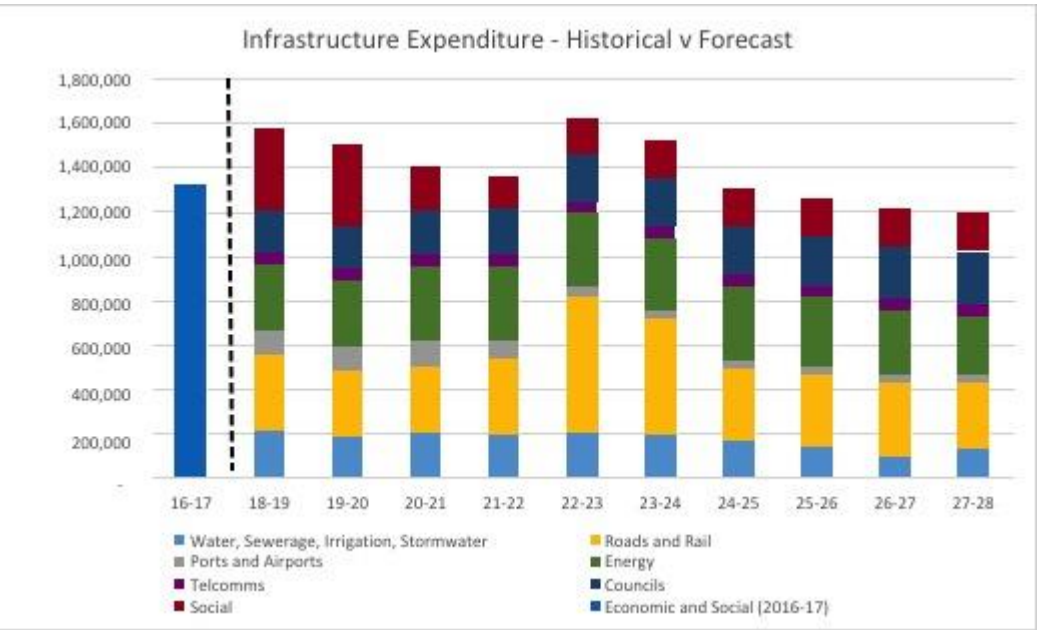
- construction (public): $862 million
- roads, highways and subdivisions: $256 million
- bridges, railways and harbours: $92 million
- electricity generation, transmission (etc.) and pipelines: $190 million
- water storage and supply, sewerage and drainage: $133 million
- telecommunications: $34 million
- heavy industry: $103 million.

The economic activity for engineering construction totalled $1.9 billion in 2016, employing 1,555 people or 0.7% of the total Tasmanian workforce.

The 10-year project expenditure from the TIPP report shows an expected $13.3bn to be spent on infrastructure projects. For the first half (5 years) this figure is projected to be around $7.45bn, with the highest single year in 2022-23, a little over $1.6bn. In this year alone, forecast road and rail expenditure is set to increase to 38% ($600m), up from the first 4-year average of 21.8%.

[22] Tasmanian Infrastructure Project Pipeline, Tasmanian Government, July 2018

Figure 3: Infrastructure expenditure



The projects outlined in the plan are spread across the State as shown in Table 7 and are described by their stage of progress e.g. at concept stage (31% of projects) through to work in progress.

Table 7 Likely spend forecast by region, per year, 2018-2027

			2018		2019		2020		2021		2022	
Area	Project count	Forecast '$m	Projects	$m	Projects	$m	Projects	$m	Projects	$m	Projects	$m
North	40	$1,405	4	$116	19	$383	3	$381	5	$77	4	$406
North-West	43	$1,223	3	$72	14	$721	4	$80	5	$74	3	$60
South	80	$2,547	4	$80	24	$782	10	$270	10	$234	9	$771
Statewide	84	$2,698	4	$208	74	$2,318	1	$120	0	$0	0	$0
Total*	**240 #**	**$7,873**	**15**	**$476**	**131**	**$4,204**	**18**	**$851**	**20**	**$385**	**16**	**$1,237**

	2023		2024		2025		2026		2027	
Area	Projects	$m	Projects	$m	Projects	$m	Projects	$m	Projects	$m
North	1	$5	3	$29	0	$0	0	$0	0	$0
North-West	4	$55	1	$17	2	$32	2	$64	3	$27
South	6	$90	6	$95	4	$47	1	$16	3	$70
Statewide	1	$6	1	$8	1	$11	1	$10	0	$0
Total*	**12**	**$156**	**11**	**$149**	**7**	**$90**	**4**	**$90**	**6**	**$97**

 # 6 projects were due to commence pre-2018 and one forecast to commence post-2027, bringing the overall total project count to 247.

Total region forecast likely spend 2018-2027 with projects at 'concept stage' removed

Area	Likely spend '$m	Difference '$m
North	$893	-$512
North-West	$454	-$769
South	$1,583	-$964
Statewide	$2,520	-$178
Total*	**$5,450**	**-$2,423**

* Totals may vary due to rounding.

In order to model the effect of forecast work on occupation numbers the following approach was taken:

1. a baseline of productivity for each occupation was established using census data and the value of work done by each sector in the corresponding period
2. the value of new work, year on year, described in the infrastructure plan was established (subtracting from the 2016 base)
3. attrition rates were established (validated by the steering committee) and built into the year on year occupation totals
4. forecast requirements were calculated for each occupation based on its productivity rate (1), the value of new work (2), subtracting attrition (3).

When graphed year on year the new requirements (accounting for attrition) are shown in Figure 4. These are new workers in addition to the existing workforce numbers and includes an approximate weighting for worker attrition to account for those whom retire or leave the workforce sector. The effect of projects in 'concept stage' not proceeding would be to reduce requirements by 30% (should none of the concept stage projects proceed).

Figure 4: New workers required to meet TIPP forecasts

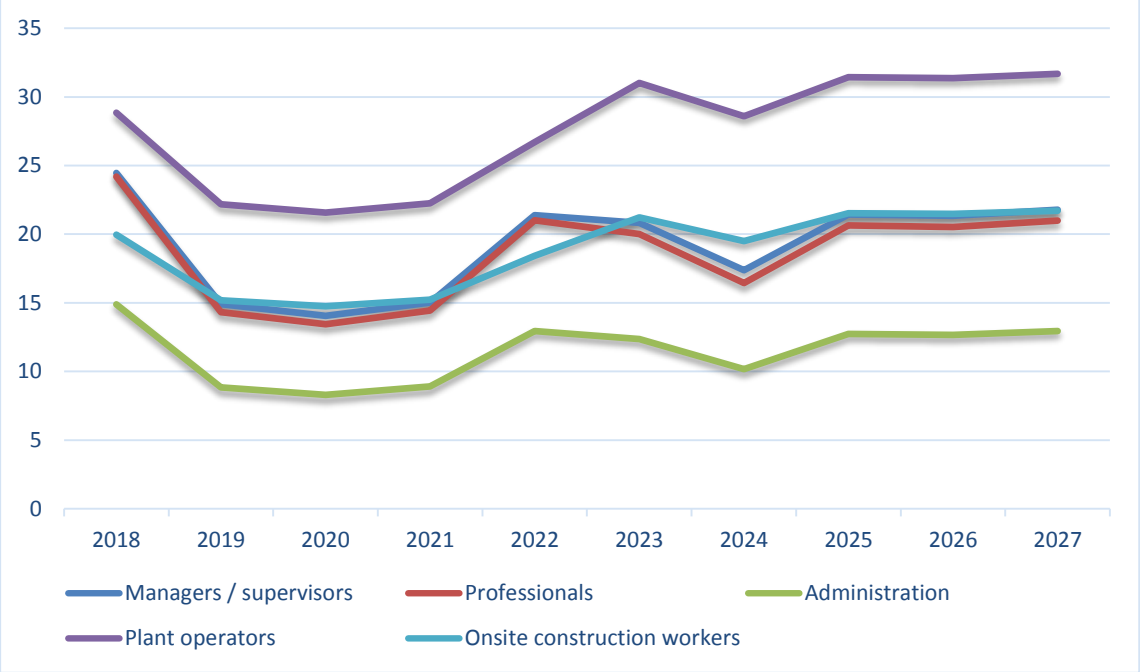
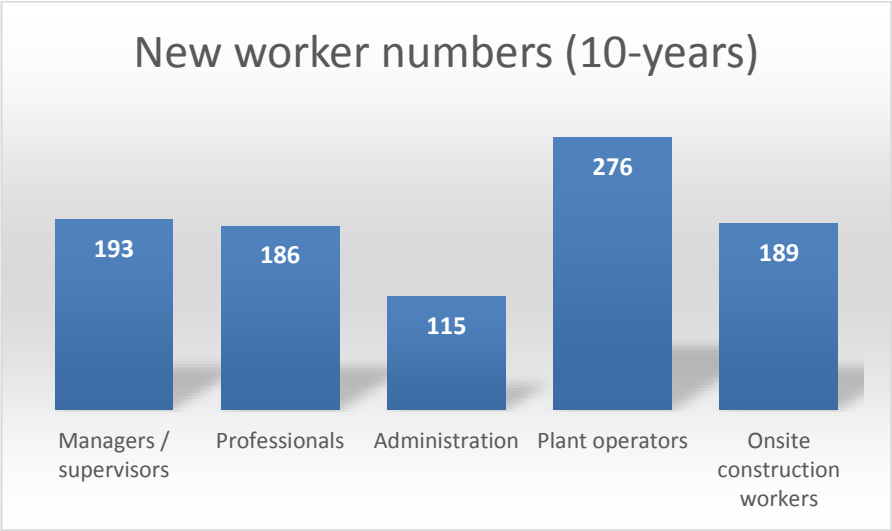


Figure 5: Total new worker requirements 2018-2027



Anecdotally from industry consultations, much of the increase in the workforce has already occurred between the census date of 2016 and today. Between the 2016 ABS data and the TBCITB report, an increase of between 15-20% across the overall civil construction occupational workforce has probably occurred bringing the anticipated size of the workforce in 2020 to a little over 2,000 workers.

The challenge commented on in every industry consultation is the 'lumpy' nature of work making it difficult to maintain workers to meet unconfirmed future pipeline activity. This challenge is compounded by difficulties attracting operators with sufficient experience and industry context. Given the industry will require approximately 30 new plant operators and 20 paraprofessionals every year for the next ten years it is critical that the actions outlined in this plan are implemented to mitigate the loss of critical skills and knowledge from the industry.

The forecast figures graphed in Figure 5 are further broken down by region and occupation in Table 8.

Table 8: Top occupational role number forecast contribution by region, Tasmania future projection 2018-2022

		Approximate new worker numbers, per year			
Area	**Occupational Role**	**H**	**L/NE**	**SE**	**W/NW**
Managers	133111 Construction Project Manager	33	12	5	11
Professionals	312112 Building Associate	15	22	7	13
	323211 Fitter (General)	13	14	3	7
	331212 Carpenter	8	4	3	16
Administrators	531111 General Clerk	10	13	0	11
Plant operators	721000 Mobile Plant Operators	21	13	5	12
	721211 Earthmoving Plant Operator (General)	18	12	9	11
	721214 Excavator Operator	20	20	10	20
	733111 Truck Driver (General)	44	36	6	35
Labourers	821111 Builder's Labourer	21	17	8	19
	821511 Paving and Surfacing Labourer	48	35	30	43
Total*		251	199	87	199

The table above shows the projected new worker numbers that would be required, per year, for the 10-year plan. The numbers do vary slightly from year-to-year, but the change is only minimal.

Region key:
H: Hobart
L/NE: Launceston and North East
SE: South East (excluding Hobart)
W/NW: West and North West
* Totals may vary due to rounding.

What needs to be done?

To meet the requirements of the Tasmanian Government Infrastructure Pipeline the industry will need to recruit approximately 25 new managers, 25[23] new para professionals and 35 new plant operators per year.

It is clear that matching supply (of graduates) to industry demand is highly problematic and left unchecked tends to gravitate to an oversupply of generalist pathways lacking in context and specialist skills required. Further participation by industry to drive the training system will provide connectivity and industry intelligence, necessary to inform stakeholders (including government) of industry demand and for the continuous improvement in the development of training programs, funding support and services.

From the data provided in Table 5 and validated by the challenges described during consultations there are a number of strategies and actions that need to be implemented to ensure these pathways are established, attractive to new recruits and supported by industry and government.

With notable exceptions, the civil construction industry does not have an established training or strategic workforce planning culture, with the bulk of training or development activity being focused on tickets and licences required for compliance with legislative requirements e.g. heavy vehicle licences and health & safety.[24] There is a continuing need for development and support for formal qualifications at all levels, for both plant operators and paraprofessionals. Current practice to addressing any labour or skills shortage is through a combination of word of mouth recruitment (68%), subcontracting (60%), labour hire (45%) and upskilling staff (45%).[25]
For the civil construction industry to truly invest time and resources into workforce planning and development and to realize the benefits, support mechanisms need to be put in place alongside mechanisms to provide greater surety of future work.

Whilst the industry is currently facing challenging times in relation to continuity and future work projections it is evident that, with the combination of an aging workforce, retrenchments, retirements and the lack of recruitment activity that the existing workforce will deplete in terms of its skills base. The cost of rebuilding the workforce based on reactive response plans creates the inevitable labour shortage, followed by the skill shortage. The passing on of skills is vital.

The role of the industry peak body, CCF Tasmania is therefore critical in providing leadership and governance of this workforce plan. This is not without its challenges and requires deliberate connection and collaboration with Government, education providers, and peak bodies with a shared interest such as Engineers Australia. It is clear that industry also needs to buy into this process.

[23] Average per year allowing for non completions/ dropouts
[24] Civil Construction Workforce Plan 2013-15
[25] Results of the survey of civil construction businesses 2018, TBCITB 2018

Recommendations

The Civil Construction Roundtable placed the following recommendations in priority order:

1. governance arrangements be established in partnership with Engineers Australia and involving relevant education, industry and government stakeholders (Skills and Infrastructure) to steer the implementation of this workforce development plan.
2. support be provided for a dedicated resource to drive the actions arising from this Plan
3. to develop and deliver a specific program of skills development for existing paraprofessionals. This program should cover digital technologies, quality assurance, onsite supervision, contract and project management
4. support be provided to assist industry to increase engagement with school based and apprenticeship pathways. This should include an industry wide career attraction program be developed to rebrand the industry as one with great career prospects
5. an industry wide training calendar – the aim of this service is to provide CCF members with a calendar of upcoming training opportunities that accommodates fluctuating demand for the industry's services
6. develop and deliver a fast track project management course
7. facilitating a small business workforce capability development service – the aim of this service is to support businesses to improve their workforce planning and development capability.
8. providing onsite assessment for compliance purposes – the aim of this service would be to facilitate recognition of operator skills to assist interstate and migrant workers to enter the Tasmanian industry. This would assist with the recruitment of new plant operators into the industry
9. the Civil Contractors Federation consider establishing services to offer:
    a. training brokerage – the aim of this service would be to aggregate industry requirements and facilitate training offering to meet this demand. Areas identified as in demand:
        i. continuing professional development opportunities, particularly those that support the passing and transferring of skills onto others such as a mentoring program
        ii. to develop a general onsite induction program for TIPP projects
    b. providing a group training service – the aim of this service would be to stimulate apprenticeship (both trade and higher level) activity and could be delivered through a partnership or establishment of a new service

Appendix 1: National context

Many large infrastructure projects across the country have attracted multinational companies to Australia in recent years. This has created more jobs in the civil infrastructure sector and led to a greater focus on the skills required to carry out these projects. Often these companies work together as consortia to lead major civil construction projects, such as the $1.4bn Toowoomba bypass led by the Nexus Infrastructure consortium, which over 3000 people have worked on so far.[26] These large infrastructure projects are attracting workers formally employed in the mining industry, highlighting the need for training which supports movement between different industries. As multinationals are often more exposed to new technologies, they bring innovation to the sector as they work alongside local companies, creating a need for training to equip workers with an understanding of new skills and techniques.

Industry's revenue has fluctuated significantly over the past five years, reflecting the start-up and completion of several large-scale motorway, bridge and tunnel developments. The industry's performance has been underpinned by strong growth in federal, state and local government capital expenditure on road construction and maintenance, including substantial upgrades to existing public roads. The performance has also been supported by the continued long-term trend towards private sector investment in toll roads.

Industry revenue is expected to increase at an annualised 5.1% over the five years through 2018-19, to $28.6 billion.

The value of work done on road and bridge construction has fluctuated widely over the period due to the start-up and completion of large-scale private and public sector road projects. Investment surged over the three years through 2017- 18 due to the staged construction of the NorthConnex and WestConnex projects in Sydney, and the start-up of the West Gate Tunnel Project in Melbourne.

However, the completion of core tunnelling work on the NorthConnex project, and the completion of several major road upgrades in Brisbane and Melbourne is forecast to reduce industry revenue by 5.8% during 2018-19. Despite this contraction, the industry continues to operate near historically high levels.

Public sector funding for road and bridge construction is forecast to account for the bulk of industry work done in 2018-19, with much of this allocated through state road authorities, which also participate in road construction and maintenance.

Industry revenue is forecast to increase at an annualised 2.1% over the five years through 2023-24, to $31.7 billion. The industry's growth will be underpinned by construction progressing on several major developments, including the WestConnex in Sydney, the Bruce Highway Upgrade Program in Queensland and the West Gate Tunnel Project in Melbourne. Stronger demand for roadworks on new residential subdivisions is also projected to underpin the industry's solid performance. The planned start-up of the $16.5 billion North East Link project in Victoria in 2020-21 will also provide some stimulus to the National industry.

[26] https://www.thechronicle.com.au/news/toowoomba-range-crossing-major-boost-economy/3196449/

Environmental issues

Investment in renewable energy projects in Australia will create more jobs in the civil infrastructure sector

Australia has jumped up the global renewable energy rankings following investment of more than $7.5 billion in wind, solar and rooftop installations in 2016-17.[27] The Clean Energy Council (CEC) believes these projects will deliver $8.8 billion in investment, more than 4,469 MW of new renewable energy capacity, and create more than 4,930 direct jobs.[28] This will lead to an increased need for training to meet the demand for workers to complete these projects across the country.

It is expected that Australia will exceed the 2020 Renewable Energy Target set by the Federal Government.[29] Solar energy is a key focus, with New South Wales and Queensland governments approving record numbers of solar farms in recent years.[30] Snowy Hydro 2.0 is another example of the Australian Government's commitment to renewable energy, generating more reliable energy, cheaper electricity, better infrastructure and more jobs for NSW and Victoria.[31]

[27] http://www.invest.vic.gov.au/news-and-events/2017/may/australia-leads-in-renewable-energy-investment
[28] Figures correct as at 3 November 2017. https://www.austrade.gov.au/international/invest/investor-updates/2017/australian-renewable-energy-projects- deliver-a-8-8bn-in-investment
[29] http://www.abc.net.au/news/2018-04-18/renewable-energy-capacity-to-exceed-impossible-target/9667870
[30] https://www.theguardian.com/australia-news/2018/feb/11/australias-solar-power-boom-could-almost-double-capacity-in-a-year-analysts-say
[31] The Australian, 5th April 2018, Snowy Hydro 2.0's pipeline to a green future

Appendix 2: Organisations consulted

Altus Traffic
Andrew Walter Constructions
Bogdan Michalkowski Excavation & Cartage
Bridge Pro Engineering
Civil Contractors Federation
Channel Earthmoving Pty Ltd
Downer EDI Works Pty Ltd
De Kleine Constructions Pty Ltd
Geotas Pty Ltd
Gradco Pty Ltd
Groombridge Civil Pty Ltd
Hall Earthmoving Pty Ltd
Hudson Civil Pty Ltd
KP Asphalting
Onlinez
Paneltec Asset Services
Paul Zanetto Pty Ltd
RCCC Civil Contracting Pty Ltd
Shaw Contracting (Aust) Pty Ltd
TNT Excavations Pty Ltd
TasWater
Department of Education
Tasmanian Building and Construction Industry Training Board
TasTAFE
University of Tasmania

Civil Construction Forum attendees:

The Hon Jeremy Rockliff - Minister for Education and Training
Allan Garcia CEO Infrastructure Tasmania
Hollingsworth, Stuart (Skills Tas) Director, Workforce Policy and Strategic Directions
McGee, Michael (Skills Tas) Industry Liaison Officer
Rachael Matheson (CCF)
Camille O'Meara General Manager Asset Services Stornoway and Director CCF
Lincoln Bromwich (CCF) and CEO VEC Civil
Gallasch Rosita (Minister Rockliff's Advisor)
Gregory, Shane (State Growth) - GM Roads Tasmania
Megan Gunn Director Vocational Learning and Career Education Support and Development DoE
Bill Abbott -CEO Ian Harrington Group (CCF Board)
Lauren Jago , Stornoway
Sean Crane (TasTAFE) - CEO
Grant, Jon (TasTAFE) - Divison Manager
Neridene Bracken Ian Harrington Group Corporate Services Manager
Matthew Palmer - Tas Irrigation
Stewart Geeves - Andrew Walter Constructions - Director CCF

Renee Anderson - Executive Director Strategy & Engagement (DPAC
Kate Blizzard - TasWater
Jim Irvine - Shaws Contracting
Hugh Maslin - Shaw Contracting and President CCF
Fred Lijauco Workforce Development Manager - Training Board (TBCITB)
Brendon Moore - Andrew Walter Constructions
Damian Pearce HR - RCCC Ciivl Contracting
Melissa Flynn - TasWater Strategic Workforce Planning
Simone Reynolds - Human Resources & Safety Manager and Acting Deputy CEO Tas Irrigation
Rolfe Brimfield - Taswater Department Manager HR Services
Emily Roden -EGM Safety and Culture Hazell Brothers
Geoffrey Hazell - Managing Director Hazell Brothers
Jesse Brunskill - Construction Manager Hazell Brothers
James Atkinson - Xite Consulting Pty Ltd
Ian Williamson - Team Leader, Contracts Performance and Delivery TasNetworks
David Pointing - Engineers Australia
Brian Daws - Civil delivery Manager at Hydro Tasmania
Sandy Menadue - Director Learning 9 to 12 DoE
Moya Fyfe - UTAS Director, Strategic Partnerships & Engagement, College of Science and Engineering
David O'Byrne - Shadow Minister (Observer)
Neale Tomlin TasRail

Appendix 3: Top 30 occupations by region, by type of work, Tasmania 2016, full table

Occupation (ANZSCO 2013, Version 1.2)	Statistical Area 4 of Usual Residence														
	601 Hobart			602 Launceston and North East			603 South East			604 West and North West			Total Tasmania (a)		
	Industry (ANZSIC 2006, Revision 2.0) (b)														
	Road and Bridge Constr'n	Other Heavy and Civil Engineering Construction	Total	Road and Bridge Constr'n	Other Heavy and Civil Engineering Construction	Total	Road and Bridge Constr'n	Other Heavy and Civil Engineering Construction	Total	Road and Bridge Constr'n	Other Heavy and Civil Engineering Construction	Total	Road and Bridge Constr'n	Other Heavy and Civil Engineering Construction	Total
821511 Paving and Surfacing Labourer	49	0	47	34	0	34	29	0	29	35	0	42	151	3	155
733111 Truck Driver (General)	33	14	43	30	3	35	5	3	6	26	4	34	90	33	121
721214 Excavator Operator	11	11	20	11	7	20	7	3	10	9	6	20	37	29	70
821111 Builder's Labourer	8	19	20	14	6	16	3	5	8	17	7	18	39	32	65
133111 Construction Project Manager	11	22	32	4	11	12	3	0	5	10	8	11	29	37	61
312112 Building Associate	7	7	15	11	12	22	9	3	7	9	8	13	34	29	58
721000 Mobile Plant Operators	8	5	20	13	0	13	6	0	5	12	0	12	40	6	51
721211 Earthmoving Plant Operator (General)	14	8	18	9	0	12	9	0	9	11	0	11	40	7	51
323211 Fitter (General)	4	10	13	4	8	14	0	0	3	0	6	7	6	30	36
531111 General Clerk	7	3	11	3	5	14	0	0	0	3	6	12	17	17	33
331212 Carpenter	3	4	7	4	3	4	3	0	3	12	3	15	22	13	31
711000 Machine Operators	10	3	11	3	4	9	0	6	7	4	6	7	22	17	31
233211 Civil Engineer	10	8	21	3	3	8	0	0	0	0	0	3	19	15	29
322311 Metal Fabricator	0	7	9	0	0	4	0	0	3	12	8	17	11	15	27
721200 Earthmoving Plant Operators	3	4	11	5	3	7	5	0	5	0	4	4	16	12	26
721215 Grader Operator	3	0	3	10	0	10	8	0	8	4	0	4	25	0	25
512111 Office Manager	4	5	8	0	8	4	0	0	0	3	0	5	11	7	22
251312 Occupational Health and Safety Adviser	3	8	5	0	3	3	3	0	3	4	0	3	11	7	21
511112 Program or Project Administrator	3	7	8	3	0	3	0	0	0	0	9	8	10	14	21
551111 Accounts Clerk	6	3	12	0	0	0	0	0	0	3	3	7	9	9	19
700000 Machinery Operators and Drivers	3	0	3	3	3	5	0	3	4	4	0	3	11	5	18
321211 Motor Mechanic (General)	3	9	13	0	0	0	0	0	0	0	0	3	5	10	17
334111 Plumber (General)	3	4	6	0	4	4	0	0	0	0	9	9	3	12	17
341111 Electrician (General)	0	0	0	0	6	6	0	3	3	0	3	3	0	16	16
111111 Chief Executive or Managing Director	5	4	8	5	3	5	0	0	0	3	0	3	10	5	15
111211 Corporate General Manager	3	3	4	0	0	3	0	0	0	3	0	4	10	5	15
132311 Human Resource Manager	3	3	9	0	0	0	0	0	3	0	0	4	6	6	15
899923 Road Traffic Controller	6	0	11	3	0	3	0	0	0	3	0	3	12	0	13
132211 Finance Manager	3	0	3	0	3	3	0	0	0	0	0	0	7	4	12
133112 Project Builder	0	3	6	3	0	3	0	0	3	0	0	0	10	5	12