

Industry Skills Forecast and Proposed Schedule of Work

Mining, Drilling and Civil
Infrastructure

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Executive summary

The Mining, Drilling and Civil Infrastructure (MDCI) sector encompasses workers involved in mining, drilling, quarrying and civil infrastructure. MDCI workers undertake a broad spectrum of activities within these sub-sectors, including extracting and processing resources and operating plant and equipment to applying workplace safety and environmental sustainability practices. In 2018, the sector employed over 350,000 workers in Australia.¹ Nationally recognised training products for this sector are housed within the Resources and Infrastructure Industry (RII) Training Package, which provides the competency standards for learners working, or seeking work, in the sector.

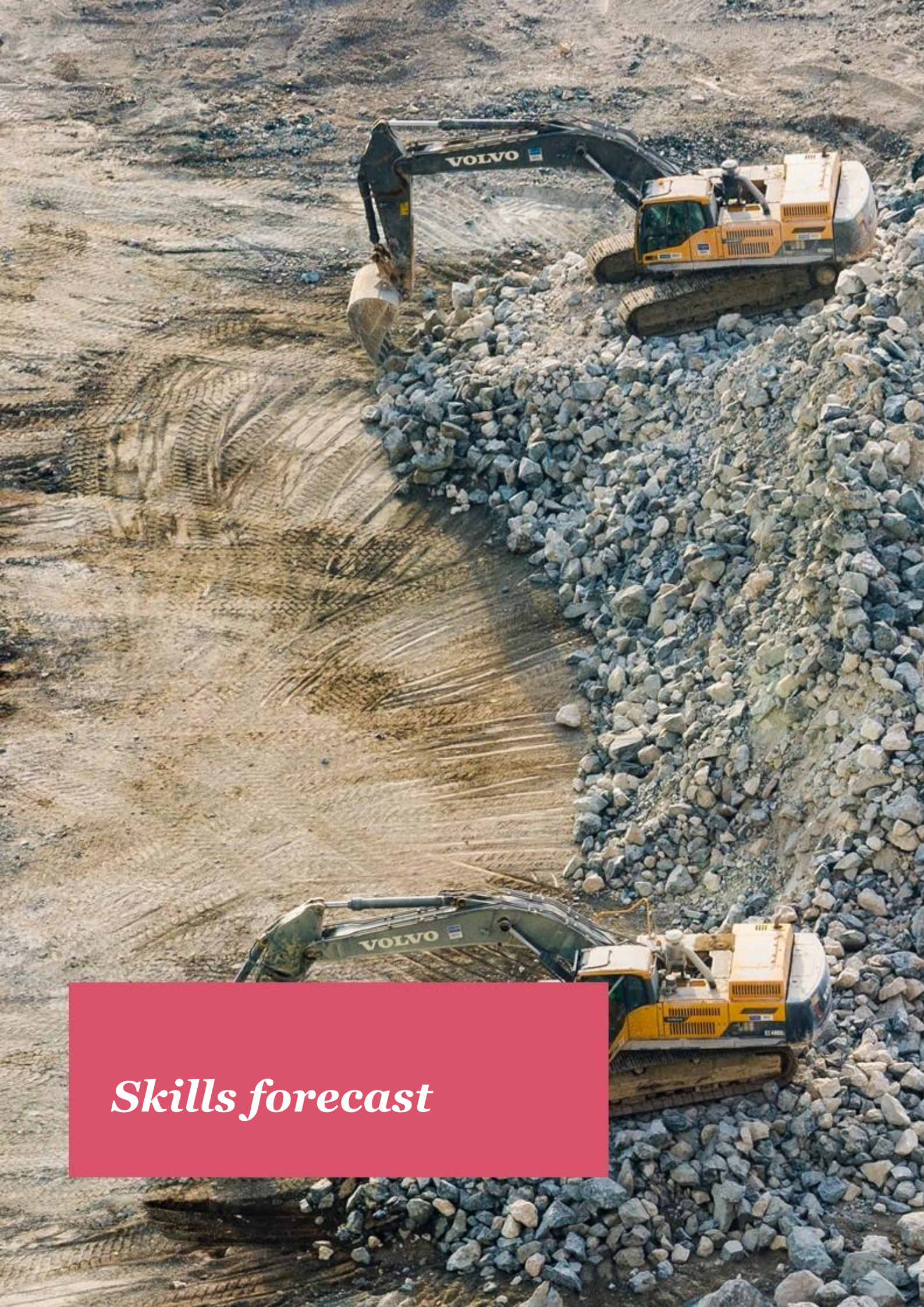
PwC's Skills for Australia and the MDCI Industry Reference Committees (IRCs) have undertaken, and continue to undertake, projects to address new and emerging skills needs in the MDCI sector. In addition to these, this proposed schedule of work for 2019-20 includes the following projects:

- **Civil Construction**, which proposes to update training products to address evolving skills needs for civil construction operators, designers and managers, due to increased uptake of new technologies (including polymer stabilisation for road pavements, remote control shot-creting and levelling, and Building Information Modelling (BIM)),² and increased scrutiny of health, safety and environment standards on construction sites.³ The project further proposes to assess training products to clarify training pathways for learners and employers associated with these job roles.
- **Metalliferous mining and resource processing**, which proposes to update training products in response to changing skills needs for metalliferous mining operators, managers and specialist technicians in resource processing, due to increased attention on tailings dam compliance and safety,⁴ and growth in remote operating centres and autonomous vehicles.⁵ The project further proposes to assess training products to remove obsolete content and clarify training pathways for learners and employers associated with these job roles.
- **Extractive**, which proposes to update training products in response to new skills needs for open cut mining and quarrying operators and managers, due to increased fatalities and critical injuries in connection with planning and construction for dumps, ground control and dust management activities,⁶ and increased adoption of remote operating centres and autonomous vehicles.⁷ The project further proposes to assess training products to mitigate content duplication and clarify training pathways for learners and employers associated with these job roles.



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Skills forecast

1 Sector overview

1.1 The sector at a glance

The Mining, Drilling and Civil Infrastructure (MDCI) sector encompasses a broad range of businesses and workers involved in mining, drilling, quarrying and civil infrastructure. The activities undertaken by these businesses are broad in nature, ranging from extracting and processing resources on a mine site or oil rig to operating plant and equipment to support and maintain civil infrastructure works.

The breadth of activities in the sector means that most individuals, businesses and organisations interact with, and benefit from, the sector in some way. This can be seen through the construction of roads, bridges and railways that connect our cities or the billions of dollars in revenue generated from exporting minerals, metals and petroleum overseas (amounting to \$248 billion in 2018 or 72 per cent of Australia's goods exports).⁸ In 2018, the MDCI sector employed over 350,000 workers.⁹

Civil infrastructure

Workers in this sub-sector (which is also referred to as civil construction) support are involved in constructing and maintaining civil infrastructure works. Civil infrastructure generally refers to infrastructure excluding commercial and residential buildings, such as roads, railways, bridges, dams and pipelines.

Coal mining

Workers in this sub-sector are involved in open cut (surface) and underground coal mining and processing.

Drilling

Workers in this sub-sector are involved in onshore and offshore drilling for oil and gas, as well as drilling associated with mineral exploration and production (such as coal), geothermal energy production, water wells, civil infrastructure and agriculture.

Extractive industries (quarrying)

Workers in this sub-sector are involved in extracting raw materials used in building and construction, including sand, rock, gravel and limestone.

Metalliferous mining

Workers in this sub-sector are involved in open cut (surface) and underground mining and processing minerals including iron ore, copper, nickel, gold, silver, zinc, gemstones, uranium and mineral sands.

1.2 Training Package at a glance

1.2.1 Training Package description and use

Of the 4.2 million learners enrolled in vocational education qualifications in 2017, there were over 85,000 learners enrolled in the Resources and Infrastructure Industry (RII) Training Package, comprising 2 per cent of all learners.¹⁰ Enrolments by sub-sector are shown in Table 1 and Appendix B sets out enrolments in all MDCI qualifications. Table 1 shows that the majority of enrolments are in civil infrastructure and cross sector qualifications, which are qualifications that apply to multiple sub-sectors across MDCI such as Certificate II in Resources and Infrastructure Work Preparation and Certificate III in Surface Extraction Operations. Additionally (as can be seen in Appendix B) a majority of these enrolments are in a few key qualifications.

In addition to the learners who are enrolled in nationally endorsed RII training products, industry consultation has indicated that RII training products are commonly also used as a framework against which site-specific training or Verification of Competency (VOC) occurs. This suggests that the number of learners and employers making use of RII training products is greater than that suggested by this enrolment data alone.

Table 1: Enrolments by qualification and sub-sector

	Qualification					
	Cert. I	Cert. II	Cert. III	Cert. IV	Dip.	Adv. Dip.
Civil infrastructure	-	2,820	35,830	1,715	535	55
Coal mining	-	770	240	915	25	15
Extractive industries	-	-	-	-	-	60
Drilling	-	2,490	1,665	280	125	-
Metalliferous mining	-	295	300	160	-	-
Cross sector	480	16,845	18,965	255	175	-

Source: National Centre of Vocational Education Research (NCVER) (2018) *Total VET Students and Courses 2017*

Note: Only the Advanced Diploma of Extractives Industries Management is included in Extractive industries as other relevant qualifications are classified as cross sector.

1.2.2 Challenges and opportunities with the Training Package

The current RII Training Package is a comparatively large Training Package, containing 58 qualifications, 33 skill sets and 788 native units of competency (UoC). This reflects the Training Package's role as serving a broad range of job roles in the MDCI sector and presents both challenges and opportunities, as follows:

- **Tailored training is required.** Employers perceive an opportunity for the Training Package to be used in retraining and reskilling people who move into the resource sector,¹¹ as the technical skills developed outside the sector are often not applicable. For example, individuals who hold maintenance qualifications obtained in a different industry sector will often need substantial retraining when they enter the resources sector.¹² This is in part due to the size and complexity of safety hazards associated with the plant equipment used in the MDCI sector, as well as the remote nature of much of the work.
- **Attracting new workers, and retaining existing ones, can be challenging.** Stakeholders suggest that due to the MDCI sector's sensitivity to economic cycles, it can be difficult for employers to attract and retain skilled workers in downturn periods. Therefore, there is opportunity for the Training Package, given its broader nature, to assist MDCI workers to transition between job roles as demand for labour shifts. Industry suggests that this can be achieved through increased focus developing skills that are transferable across sectors. This may include further review of cross sector MDCI skills (see Appendix B for a list of relevant qualifications), and relevant enterprise skills, such as communication, leadership, digital literacy and problem solving. If successful, for example, this may allow mining and drilling workers to transition into quarrying and civil infrastructure job roles, and vice versa, more seamlessly as labour demand shifts.

1.2.3 Training Package collaboration opportunities

The Australian Industry Skills Committee (AISC) has identified several cross sector skill areas where opportunities exist to create flexible and transferable package components that will benefit industry, learners and the broader VET sector. These include projects such as: teamwork and communication, digital skills, cyber security, automation, big data, and environmental sustainability.

Where these current cross sector projects have particular relevance, they are set out in the context of the projects in the proposed schedule of work (see Section 6). PwC's Skills for Australia and the MDCI IRCs will continue to look for, and participate in, opportunities for collaboration across industries where available.

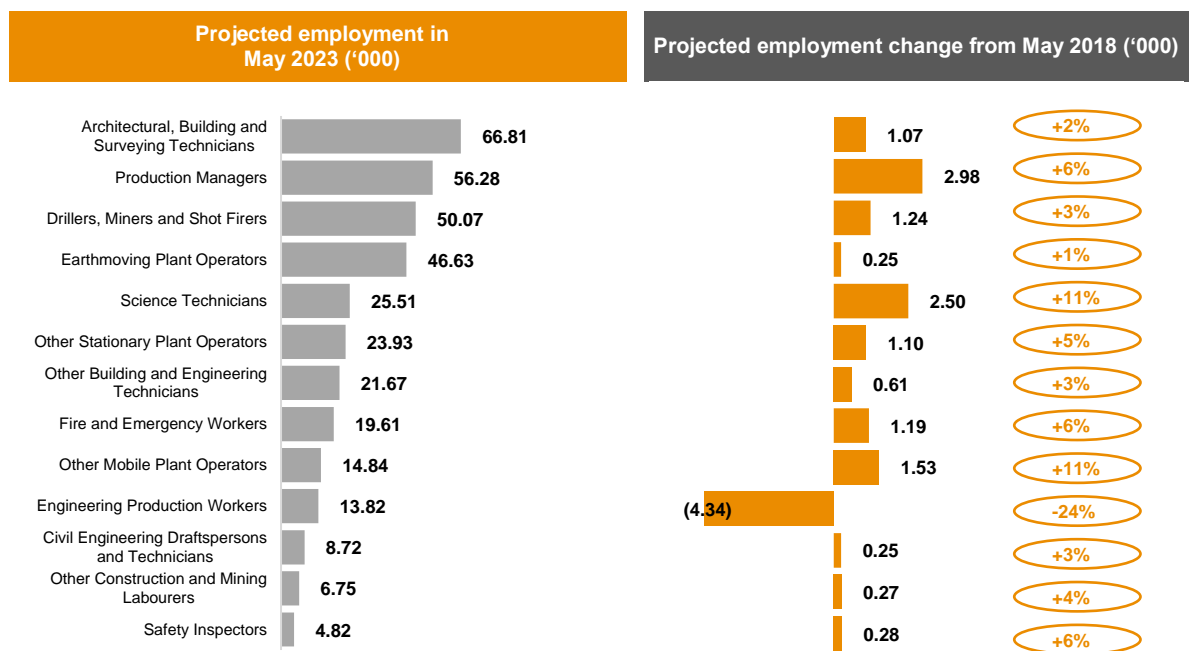
One example that offers significant collaboration opportunities for MDCI is the teamwork and communication cross sector project, which will likely be applicable for all job roles within the sector. In particular, industry notes that increased uptake of autonomous and remote management technologies will likely see demand for supervisory and management job roles increase. As MDCI workers transition from operators to supervisors, it is likely that strong foundations in teamwork and communication skills will be highly desirable from employers.

2 Employment and skills outlook overview

2.1 Employment outlook

Consistent with previous Industry Skills Forecasts, employment projections for the MDCI sector are represented by a range of occupation divisions (as defined by ANZSCO) which align to job roles in the MDCI sector, as below.

Figure 1: Projected employment levels for MDCI occupations



Source: Department of Jobs and Small Business (2018) *2018 Employment Projections - for the five years to May 2023*.

2.2 Skills outlook

2.2.1 Current and emerging skills needs

In general, a worker in the MDCI sector will need two specific sets of skills:

- **Technical skills**, which are typically specific to sub-sector in which the worker operates. In general, technical skills require an understanding of two overarching elements. Firstly, workers must be able to understand and apply regulations and standards associated with plant, equipment and practices in their workplace. Secondly, workers must have an awareness of the various health, safety and environmental risks associated with the plant, equipment and practices in their workplace, and be able to apply the appropriate measure to mitigate those risks. Broadly, the key technical skills required in the sector are:
 - **Operating plant and equipment**, which includes activities such as excavating, moving and manipulating earth, ore and rock; or assembling, operating and dismantling equipment on work sites
 - **Extracting and processing resources**, which includes activities such as refining and treating metals and mineral ore; or positioning and priming explosives using detonators and explosive cartridges

- **Applying environmental sustainability practices**, which includes activities such as ensuring disposal of tailings or overburden are compliant with standards and regulations; or conducting field and laboratory experiments to test surrounding ecosystems for contamination
- **Applying workplace safety practices**, which includes activities such as ensuring the quality and availability of emergency procedures and equipment and ensuring workplace practices are compliant with site policies
- **Supporting civil construction works**, which includes activities such as supervising and inspecting civil construction sites; estimating time, costs and resources; or directing and performing fieldwork and laboratory testing.¹³
- **Enterprise skills**, such as teamwork, communication, creativity, digital literacy and problem solving, that are about ‘how’ a worker operates in the workplace and are transferable across roles.

Due to the evolution of technology and increased focus on health, safety and the environment in the sector (covered in more detail in Section 3 below), the mix of technical and enterprise skills is changing for MDCI workers. In particular, industry consultation suggests that the emergence of autonomous and remote management technologies is supporting demand for enterprise skills. Broadly, industry indicates that more advanced communication, digital literacy and problem solving skills will be required from workers who interact with these technologies. For example, autonomous drilling systems equipped with ‘cyber chairs’ see workers operating drills using a joystick, analysing issues and diagnosing solutions based on real-time data fed back from remote sensors.¹⁴ Industry further suggests that many existing skills are becoming more crucial as regulation tightens in the sector, such as applying environmental sustainability and workplace safety practices.

These skills will be a core part of ongoing work on the Training Package (see Section 5 for current projects) and PwC’s Skills for Australia and the MDCI IRCs intend to continue to consult with industry to ensure these emerging skills are captured in the Training Package.

2.2.2 Key generic skills

The Industry Reference Committees (IRCs) are required to rank a supplied list of 12 generic workforce skills in order of importance to relevant employers. For the MDCI sector, these skills have been ranked below in Table 2, with ranking 1 being the highest and ranking 12 being the lowest.

All the skills listed in Table 2 are important. A low ranking does not imply that the skill is not important, but rather lower ranking only indicates that the skill is not a critical priority for the MDCI sector. Further, Table 2 only shows rankings of importance as an average within a sub-sector and some skills may have higher or lower importance for particular organisations and particular job roles.

Table 2: Ranking of key generic workforce skills

Generic Workforce Skill	Civil Infrastructure	Coal Mining	Drilling	Extractive Industries	Metalliferous Mining
Language, Literacy and Numeracy (LLN)	1	6	1	1	6
Managerial/Leadership	5	1	7	2	4
Design mindset/Thinking critically/System thinking/Solving problems	6	2	2	7	2
Technology and application	3	5	4	6	1
Learning agility/Information literacy/Intellectual autonomy and self-management	2	3	3	5	3
Science, Technology, Engineering and Mathematics (STEM)	4	8	5	3	7
Data analysis	10	7	9	11	5
Communication/Collaborating virtually including virtual collaboration/Social intelligence	8	4	10	10	8
Financial	11	9	11	4	11
Customer service/Marketing	7	12	6	12	10
Environmental and Sustainability	9	10	8	9	12
Entrepreneurial	12	11	12	8	9

Source: Formal activity undertaken by IRC members, confirmed April 2019.

Note: Generic Workforce Skills have been ranked in line with the definitions provided by the Department of Education and Training.

3 Key drivers for change and proposed responses

3.1 Key drivers for change overview

There are three key drivers underpinning long-term change in the Australian MDCI sector.

3.1.1 Steady economic environment

Key economic trends, including global demand for key resources and ongoing investment in civil infrastructure, have the potential to shape medium term demand for labour in the MDCI sector. Growth in rail, mining and water infrastructure, along with high levels of road construction, will likely fuel labour demand, particularly in key mining regions and major cities along the eastern seaboard.¹⁵ For workers and learners in the sector, skills that facilitate flexibility and lateral thinking will likely be valuable to secure work across different sub-sectors as major projects wind up and down.

Mining work is subdued compared to previous peaks, but is slowly increasing

Mining work is forecast to lift from post-mining boom levels as commodity prices improve and exploration activity increases.¹⁶ This can be seen through rising levels of short term and long term expected capital expenditure for mining equipment, plant and machinery.¹⁷

This uplift in work is expected to be serving overseas demand for mineral resources. In particular, Chinese demand for high quality iron ore exports remains strong, largely due to structural changes in its steel industry.¹⁸ This is reflected through recent iron ore project announcements in Western Australia's Pilbara region from the major global mining firms, such as:

- BHP's South Flank project, which is set to create around 2,500 construction jobs and over 600 ongoing operational roles.¹⁹
- Rio Tinto's Koodaideri mine, where it will pioneer its recently approved AutoHaul™ autonomous rail technology.²⁰
- Fortescue Metals Group's Eliwana mine, which is projected to create 1,900 jobs during construction and 500 full time positions once it becomes operational.²¹

Civil construction work is high, with growth likely to steady over the medium term

A steady pipeline of large civil infrastructure projects, particularly in road and rail, is anticipated to support demand for civil infrastructure work across Australia's major cities.²² However, energy policy uncertainty and the completion of the National Broadband Network (NBN) will likely put pressure on labour demand for utilities projects.²³

Transport projects comprised 88 per cent of all civil infrastructure work won in the September 2018 quarter, with State and Federal pipelines heavily skewed towards transport infrastructure.²⁴ Road and rail work is projected to increase over the 2019 financial year, before steadying over the following two financial years.²⁵ This trend is exemplified by major civil infrastructure projects across eastern states, such as WestConnex in Sydney, the West Gate Tunnel and North East Link projects in Melbourne and the Bruce Highway Upgrade Program in Queensland.²⁶

Slowdown is expected in telecommunications construction work, as the NBN roll out approaches its 2020 projected completion date.²⁷ Renewable energy projects will also likely remained subdued, which are particularly impacted by energy policy uncertainty. Notwithstanding this regulatory uncertainty, Snowy Hydro 2.0 was approved by the Board of Snowy Hydro Limited in December 2018.²⁸ Once work commences, Snowy 2.0's workforce is projected to grow from a small base in year one to an estimated 1,000 to 2,000 jobs at peak times.²⁹ Overall, strong growth in rail, road and water is

expected to maintain steady demand for labour over the medium term, despite anticipated decline in energy and telecommunications civil construction work.³⁰

3.1.2 Changing technology

New technology is shaping the types of jobs and skills required in the MDCI sector in Australia. Overall, as uptake of new technologies increases, particularly autonomous ones, advanced digital and cognitive skills will likely become more valuable to pivot and adjust seamlessly to new ways of working in the sector.

Investment in automation is beginning to pay dividends in the MDCI sector

The major global mining firms have been investing in autonomous technologies for a number of years, with many of those investments only starting to come online in recent years. In December 2018, Rio Tinto announced the successful deployment of a world-first autonomous heavy-haul, long distance rail network, AutoHaul™.³¹ Fortescue Metals Group also announced a significant expansion to its autonomous truck fleet in April 2018, with the conversion of approximately 100 haul trucks at the Chichester Hub marking the first iron ore operation in the world to have a fully autonomous fleet.³² For BHP, its investment in autonomous trucks at Jimblebar has reportedly reduced potential safety incidents involving vehicles, as well as increased truck utilisation rates by around 20 per cent.³³

Investment in autonomous technology is less apparent in civil construction. However, there are a number smaller companies pioneering new methods of automating routine construction activities. For example, in June 2018, Fastbrick Robotics announced its autonomous bricklaying robot, Hadrian X, had successfully built a 180m², three-bedroom, two-bathroom home structure in less than three days.³⁴ While this example is targeted towards residential applications, its underlying technology could foreseeably be applied in civil construction, such as road and rail.

New digital technologies are making existing roles more productive

Increased use of digital technology has been an ongoing trend in the MDCI sector for a number of years. This trend shows no sign of slowing in mining, with the industry continuing to consider how digital technologies can help improve safety for workers involved in high risk tasks.³⁵ For example, smart sensors are being used to improve operator safety, such as BHP's use of smart caps at its Escondida mine in Chile, which measures driver fatigue by analysing brain waves.³⁶ Miners are also using smart sensor and real-time process controls to improve strategic and operational decision making. For instance, Rio Tinto's 3D visualisation system, RTVis™, provides real-time data to decision makers to enable them to compare and evaluate mine data on the fly. Rio Tinto also employs drone technology for various activities ranging from site surveillance to local wildlife monitoring.³⁷

In civil infrastructure, industry feedback suggests that the projects are increasingly gravitating towards prefabricated construction. Prefabrication sees components fabricated offsite and then assembled onsite to increase the speed of development and installation. Moreover, industry feedback suggests that digital tools are more widespread across operations from project planning and design through to operation and maintenance. For example, building information modelling (BIM) provides a digital representation of the physical and functional characteristics of physical infrastructure, and in turn can help deliver projects at faster rates, lower costs and with less risk compared with traditional management processes. Specifically, BIM can facilitate improved levels of monitoring and control on a worksite as more diverse data inputs can be fed into it, such as drone footage and laser mapping data.³⁸ For learners to be successful in the sector, digital literacy will likely become more important as these technologies become more embedded in infrastructure projects. Capturing the impact of these technologies and the skills required may require collaboration across civil infrastructure and construction sectors to avoid duplication.

3.1.3 Evolving approach to safety and risk management

Securing trust with workers, regulators and local communities continues to underpin long-term success in the MDCI sector. Overall, industry consultation suggests that heightened focus on safety and

environmental threats is increasing the burden of management, and demanding increased awareness of, and responsibility for, business risks.

Safety remains the number one priority, and key metrics appear to be improving

The high risk nature of many activities in the MDCI sector demands that worker safety is constantly front of mind – the consequences are tragic when this is not the case. For mining companies, ensuring worker safety remains paramount, with many annual reports noting additional funding being deployed towards preventing injury and loss of life.³⁹ On a global level, while many mining companies reported fatalities in 2018, safety records have been improving over the past few years, with 15 out of 22 firms of the global top 40 mining firms reporting neutral or improved results relative to the prior year.⁴⁰

While fatality rates have fallen considerably from 4.8 per 100,000 workers in 2007 to 3.3 in 2016, construction still records some of the highest fatality and serious claims rates among all industries in Australia.⁴¹ Notably, among construction work, research suggests the civil construction work ranks the highest in terms of fatality rates (5.7 per 100,000) and serious claim frequency (13.4 claims per million hours worked).⁴² Among the key global players in civil infrastructure however, safety metrics appear to be strong and improving. In the 2018 financial year, Lendlease's frequency rate for high potential incidents decreased by 27 per cent year-on-year while Lost Time Injury Frequency Rate (which measures instances per million hours worked) increased marginally by 6 per cent.⁴³ Similarly, CIMIC recorded positive results in its latest annual report, including zero work-related fatalities and a 25 per cent decline in potential Class 1 injuries (i.e. injuries that may have resulted in a fatality or a permanent disability).⁴⁴

Social license to operate is becoming more important for ensuring long term success

More than ever before, firms in the MDCI sector appear to be more responsive to the societies in which they operate. As the bar for social and environmental conduct raises, there is greater risk, and therefore heightened responsibility, for workers engaged across all operations in the sector. Specifically, evolving societal attitudes towards the environment and local communities tend to be influencing mining and civil construction firms in two key ways.

Firstly, firms are being forced to redefine how they do business. This has meant minimising and remediating the environmental impact of their activities. Adjusting for a low-carbon future is a part of this equation for major global firms in the MDCI sector continuing to reduce their reliance on carbon-emitting energy sources. For example, Rio Tinto now sources almost 70 per cent of its electricity from hydro, wind and solar energy, and has reduced its greenhouse gas emissions by 27 per cent since 2008.⁴⁵ It has also meant greater transparency towards, and thus accountability for, sustainability efforts, with many of the major mining firms tending to provide more comprehensive reporting surrounding water use and carbon and greenhouse gas emissions over recent years.⁴⁶

Secondly, firms are facing pressure to reconsider which kinds of businesses they operate. This has been typified by the widespread community backlash for Adani's Carmichael coal mine proposal, which has likely played a role in its inability to secure funding from financial institutions refusing to work with the global miner.⁴⁷ Concern for environmental sustainability appears to be a common thread among prospective greenfield energy projects in Australia's infrastructure pipeline. Recent research indicates that during 2018 and 2019 Australia is expected to install approximately 10,400 Megawatts (MW) of new renewable energy, comprising of small- and large-scale solar photovoltaic (PV) systems and windfarms.⁴⁸ Overall, this will add up to about 30 per cent of Australia's peak electricity demand.⁴⁹ Provided this rate continues, it is anticipated that Australia will be capable of supplying up 50 per cent renewable energy in 2025 and 100 per cent in the early 2030s.⁵⁰

Diesel hazard control may require focus

Diesel has been classified by the World Health Organisation as a cancer-causing agent, with the ability to cause lung cancer.⁵¹ The emission of diesel fumes, in particular nano-diesel particulate matter (nDPM), from diesel vehicles and equipment are a well-known hazard for underground mining operations. Exposure to diesel exhaust can cause negative chronic respiratory health effects on workers. Hence, stakeholders have emphasised the need for greater focus on emissions maintenance and ventilation management in the RII Training Package, especially due to growing evidence of the harmful effects of nDPM.⁵²

An example of good emissions maintenance and ventilation management is installing vehicle accessories, such as exhaust extenders or filters, to tail pipes that limit and redirect exhaust fumes away from the operator. The exposure to diesel fumes in underground mining environments can be significantly reduced through a properly managed ventilation system.⁵³ This is often undertaken by ventilation officers and technicians roles, for which training products are being developed in the ongoing Common Skills project (see Section 5 for all current projects).

Fatigue management and reporting need to be addressed in the industry

Many stakeholders highlighted issues such as fatigue management and working from heights that need to be adequately addressed in the industry through the Training Package. Regulators have issued guidance materials on fatigue management and heat stress, and stakeholders have suggested a Training Package response.⁵⁴ Although these are prevalent issues in the sector, it is unclear at this stage whether general training products on hazard risk management and workplace health and safety are able to be appropriately contextualise during delivery to address this particular issue.

3.2 Proposed responses

PwC's Skills for Australia works in an ongoing manner to ensure that training products in the RII Training Package are fit for purpose and that workers in the MDCI sector have the skills required to adapt to these key drivers for change. Alongside the responses already underway (set out in Section 5), this document proposes responses for the training components that are not yet adapted to these trends.

In particular, this document sets out proposed responses in three areas:

- **Civil Construction**, to address evolving skills needs for civil construction operators, designers and managers, due to increased uptake of new technologies (including polymer stabilisation for road pavements, remote control shot-creting and levelling, and Building Information Modelling (BIM)),⁵⁵ and increased scrutiny of health, safety and the environment standards on construction sites.⁵⁶
- **Metalliferous mining and resource processing**, to respond to changing skills needs for coal and metalliferous mining operators, managers and specialist technicians, due to increased attention on tailings dam compliance and safety,⁵⁷ and growth in remote operating centres and autonomous vehicles.⁵⁸
- **Extractive industries**, to respond to new skills needs for open cut mining and quarrying operators and managers due to increased fatalities and critical injuries in connection with overburden dumps ground control and dust management activities,⁵⁹ and increased adoption of remote operating centres and autonomous vehicles.⁶⁰

The consultation undertaken for the formulation of proposed responses is shown in Section 4 and the details for each project are set out in Section 6.

4 Consultation undertaken

Approach to consultation for proposed responses

Consultation on this Industry Skills Forecast was targeted to the four areas of proposed responses and include views from industry, peak bodies, training organisations, employee associations and other relevant stakeholders.

Throughout the development of the 2019-20 Proposed Schedule of Work, individuals were consulted in person, via telephone interviews, group teleconferences, focus groups and an online public survey. The consultations so far have covered the following areas within the MDCI sector:

- **Civil infrastructure** (29 individuals consulted)
- **Metalliferous mining and resource processing** (36 individuals consulted)
- **Extractive** (32 individuals consulted)

Please see Appendix C for further detail on consultation and a list of stakeholders consulted to date during the development of the 2019-20 proposed projects, including spread across states and territories and stakeholder type. Please note that an individual may have contributed insights for more than one project in the Proposed Schedule of Work and may have provided feedback via more than one consultation method.

Key Issues and sensitivities from consultation

'Industry' opinions in the proposed projects refer to views raised and validated in consultations outlined above. It is acknowledged that additional consultation will be conducted in future project work to confirm that these opinions are largely agreed upon by a broader group of stakeholders and to determine specific changes required in the Training Package.



Proposed Schedule of Work

5 *Proposed Schedule of Work overview*

PwC's Skills for Australia is currently undergoing a number of projects to ensure that training products in the RII Training Package are fit for purpose and that workers in the MDCI sector have the skills required to adapt to these key drivers for change identified in previous sections.

The currently ongoing projects are:

- **Bituminous Surfacing**, to ensure training products align to specific job roles and provide adequate skills in asphalt laying, spray sealing, flexible pavement, operating multiple types of rollers and ensuring operational quality
- **Construction Materials Testing**, to update training products to account for changes in policies around mandatory on-site lab testing of construction materials
- **Contemporary and Emerging Blasting Methods**, to update UoCs relating blasting techniques to keep up with the rapid growth and enhancement of existing technologies and practices as well as address environmental concerns
- **Geotechnical Risks in Quarries**, to ensure training products require adequate awareness of potential hazards and ability to minimise risk at all levels of job roles
- **Mine Supervisors**, to address skills gaps with supervisors in the MDCI sector, particular around the areas of leadership, communication, and risk management
- **New and Emerging Technologies**, to update training products to keep pace with the rapid growth and enhancement of existing technologies and practices including remote operating centres, remotely operated vehicles, autonomous vehicles and drones. This project will be combined with the Metalliferous and Resource Processing project (details in Section 6.2 below) given skills of this nature are currently required in this sub-sector
- **Mobile Plant Operations and Materials Handling**, to ensure training products adequately cover mobile plant operations and materials handling within the MDCI industry and to ensure that appropriate workplace safety competencies regarding these tasks is included
- **Tyre fitting**, to ensure training products adequately cover competencies in tyre fitting within the MDCI sector and to ensure that appropriate workplace safety requirements are included
- **Traffic Management**, to update training products to establish a balance between industry's desire for rigor in assessment of this high risk work activity, the state regulators' needs for the UoCs to work within their accreditation standards, and RTOs being able to develop and implement feasible training and assessment strategies
- **Trenchless Technology**, to update training products adequately address safety standards to reduce the risk of untrained individuals drilling through underground pipes and provide greater recognition for specialist skills in the job market
- **Common Skills**, to improve training products with respect to general employability skills for roles in the MDCI sector to enable workers to move between roles in response to fluctuations in industry demand

- **Coal Mining**, to create training products for more transferable skills in coal mining, as well as update training products to reflect the impact of new technologies on ways of working, the increased safety focus among regulators and the need for greater support to develop managerial skills for leadership roles
- **Drilling and Exploration**, to align training products with the emergence of new technologies (such as sonic drilling, coil tube drilling and cyber-chair drilling) and accommodate the need for workforce agility, safety considerations and increased managerial skills within the sector
- **Emergency Response & Rescue**, to improve training products to increase the safety of workers in the MDCI sector.

The previous projects are:

- **Shotfiring**, to update training products to ensure that they adequately cover competencies to undertake underground shotfiring and mobile mixing of explosives and to ensure that appropriate workplace safety competencies are included
- **First Emergency Response**, to update training products to ensure that learners are adequately prepared in first emergency response and to ensure that appropriate workplace safety competencies for this task is included.

Given the scope of this ongoing work, the proposed schedule of work for the next four years only has proposed projects for 2019-20 (shown below). It is important that both training organisations and employers have time to understand and implement the changes made in this ongoing work before any future projects are scheduled. It is also important to note that for projects across the four years 2016-17 to 2019-20, all UoCs in the RII Training Package will have been reviewed, either through a project (where they are added, edited or removed) or in assessing if they are relevant for a project (and were found to not require editing or deletion).

However, it is also acknowledged that training products need to be adaptable and flexible. Therefore, if any significant but unforeseen technological, regulatory or other changes impact the sector, additional projects may be proposed out of cycle as needed, or, depending on urgency, within the cases for change for 2020-21 and onwards.

2019-20	<p>3A Civil Construction To conduct a comprehensive update of Civil Infrastructure UoCs and qualifications to ensure alignment with industry standards, clarify and strengthen pathways for learners and to improve the accessibility and attractiveness of Civil Infrastructure training products.</p> <p>3B Metalliferous To update metalliferous mining and resource processing qualifications and UoCs to align training standards to current job roles and responsibilities in the sector and allow learners to specialise in specific metalliferous mining or resource processing roles to allow clearer career pathways.</p> <p>3C Extractive To update the surface extraction qualifications to ensure alignment to current job roles, reduce duplication in the Training Package and ensure industry standards are increased in geotechnical awareness, ground control and dust management.</p>
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6 2019-20 Project details

This section serves as the cases for change for projects scheduled in 2019-20. It outlines the key drivers for change and how they will be reflected in 2019-20 training product development work.

6.1 Project 3A: Civil Construction

The objective of this project is to conduct a comprehensive update of Civil Infrastructure UoCs and qualifications. This is to ensure alignment with industry standards, clarify and strengthen pathways for learners and to improve the accessibility and attractiveness of Civil Infrastructure training products.

6.1.1 Rationale

Job roles affected

This project will impact job roles in the following nine sub-sectors of Civil Infrastructure: Bituminous Surfacing, Bridge Construction and Maintenance, Pipe Laying, Road Construction and Maintenance, Road Marking, Tunnel Construction, Timber Bridge Construction and Maintenance, Traffic Management and general Civil Construction. Job roles affected across all nine areas include: operators, civil construction workers, tradespeople, designers, design leads, leading hands, foreman, supervisors, construction managers, and superintendents.

Drivers for change

Industry consultations supported the need to update Civil Infrastructure qualifications and UoCs to reflect:

1. **Recent technological advancements and changing methods** being used in Civil Infrastructure. This includes new techniques in road pavement, remote controlled / laser technologies and building information modelling. Skills required to use these methods are currently unavailable in the training standards.
2. The need for **health, safety and environmental** competencies to be clearly stipulated within the training products, given stakeholder concerns about safety and incidents occurring on construction sites.
3. The need to **clarify vertical pathways** for the influx of young entrants into the sector and improve the overall **accessibility and attractiveness** of training products for learners and employers, given that uptake of training could be higher in the sector compared with other trades.

Current training products

There are 11 qualifications and 167 UoCs in the scope of this project, which were last updated in December 2015 by SkillsDMC.

In 2017, the Certificate IIIs in Civil Construction and Civil Construction Plant Operations were most popular at 8,785 and 26,835 respectively. The lowest enrolments were seen in the Advanced Diploma of Civil Construction at 20 enrolments and the Certificate III in Civil Foundations at 15 enrolments.⁶¹

There were zero enrolments in 2017 for 15 UoCs in the areas of Civil Work Design, Demolitions, Foundation Works, Materials Extraction, Road and Pavement Construction, Timber Bridge Construction and Maintenance, Trenchless Technology, Tunnel Construction and Water Management. Stakeholder feedback indicated that this may be attributed to those UoCs being used only in regional areas in Australia with those specific work activities, and therefore care should be taken before removing UoCs in those areas.

Demand for training product change

Update training products to include technological advancements and changing methods

Stakeholder feedback from consultations has highlighted that current nationally recognised training products do not, and should, accommodate for the following Civil Infrastructure specific new technologies and methods:

- Polymer and foam stabilisation technologies in road pavement
- Geotechnical-style seals for road pavement
- Vacuum extraction and excavation in underground services
- Laser and remote controlled technologies used in shot-creting and levelling
- Tunnelling Boring Machines (TBMs) in tunnelling
- Building Information Modelling (BIM) and Digital Terrain Modelling (DTM) for civil work design
- Pre-fabrication / pre-cast solutions.⁶²

Additionally, other emerging technologies such as use of drones and automated vehicles are currently being used in the Civil Infrastructure sector and should to be imported into the Civil Infrastructure related qualifications. An example of a traditionally manual task that has been automated by these technologies is conducting pipe inspections. An update of packaging rules is also necessary to ensure the availability of skills required to reflect changing methods used in current road work projects, e.g. RIIHAN305D Operate a gantry or overhead crane is required in the Certificate III in Civil Construction for those working on the Victorian M80 Ring Road Upgrade.⁶³

Health, safety and environmental work practices to be updated in training products

Consultations with site inspectors noted inconsistent standards of safety across construction sites which have contributed to incidents and fatalities occurring on site. Health, safety and environmental work practices are a priority for the industry, with 190 fatalities occurring in 2017 and 106,260 serious incident claims from 2016 to 2017 across Australia.⁶⁴ Examples of risks and hazards include the association with the operation of plant and working around plant and equipment, delineation and access (i.e. no-go zones on construction sites), work platforms and lifting, working at heights and working underground, with data from 2017 showing 50 per cent of work related fatalities related to vehicle collision and being hit by moving objects, 15 per cent from fall from heights.⁶⁵

Stakeholders have noted that changes in the RII Training Package are required to address the health, safety and environmental concerns and to ensure alignment to regulator 'best practice' examples of risks and hazard mitigation techniques (e.g. Safe Work Australia's Plant Hazard Checklist 2017).⁶⁶ More contextualisation of risks in the training standards is required in order to reach greater uniformity throughout the industry, reduce critical incidents and encourage a culture of proactively addressing hazards.

Clarification of pathways is required to assist in improving accessibility and attractiveness of training products for learners and employers

Stakeholders have requested consolidating a number of UoCs to reduce duplication as well as simplifying qualifications' packaging rules to increase flexibility across the training system. This would allow pathways to be clarified and strengthened for learners. Particular examples and evidence of the need for the above changes are as follows:

- ***A demographic transition in civil infrastructure workers is set to increase demand for qualifications, particularly for supervisory roles:*** The Civil Infrastructure sector has rapidly expanded over the last five years which has seen increased demand for supervisors on projects. Traditionally, workers were promoted to supervisors based on years of experience, however with the baby boomer generation entering retirement, younger workers are being promoted at a faster rate. Stakeholders have requested an update of qualifications to ensure

training products are correctly mapped to roles in the industry. This would also aim to encourage an uptake of supervisory training and to encourage training to be undertaken.

- ***Pathways for learners entering the Engineering profession:*** The Certificate IV, Diploma and Advanced Diploma of Civil Construction Design were cited by stakeholders as providing learners a pathway to enter into the Engineering profession. However stakeholders have indicated that these qualifications require a minimum of Australia Qualifications Framework (AQF) level 5 mathematics, statistics and knowledge of force systems in order to allow a sufficient pathway into Engineering. Competencies in these areas are not currently accommodated in the packaging rules, but should be in order to better equip learners with the theoretical knowledge required to enter into roles supporting Engineers or into the Engineering profession.
- ***Accessibility of the package to learners needs to be addressed:*** Stakeholders have requested an update to simplify the Certificate III in Civil Construction. This includes combining UoCs to address duplication and reducing the number of UoCs required to complete the qualification. This would allow the qualification to align to current job roles and assist with attracting workers to the sector. It would enable them to acquire a more applicable skill set and see a clearer pathway to progress in the industry.

6.1.2 Ministers' Priorities

The Ministers' priorities addressed by this project are as follows:

- **Obsolete and duplicate qualifications are removed from the system.** The update and consolidation of Civil Infrastructure qualifications would provide clearer pathways for learners and equip them with adequate skills for the future workforce.
- **More information about industry's expectations of training delivery is available to training providers to improve their delivery and to consumers to enable more informed choices.** Training Package components in this project will be written so they align with industry expectations for training delivery, specifically around practical experience, and will be released with a RII Companion Volume that provides additional information.

6.1.3 Consultation Plan

PwC's Skills for Australia intends to engage a wide range of stakeholders in the Civil Infrastructure sector, targeting the nine sub-sectors of the industry detailed in this section. Representation across industry, peak bodies, government and regulatory bodies, employee associations and registered training organisations will be consulted for the project, via a number of methods including:

- A Project Working Group (PWG) with experienced representatives from industry
- Focus Groups and open forums across a variety of states and regions
- Targeted one on one consultations
- Online nationwide survey(s).

Stakeholders to be consulted with include, but are not limited to:

Employers	Industry associations / Peak bodies & Unions	Registered Training Organisations	Public / Government bodies
<ul style="list-style-type: none"> Fulton Hogan Laing O'Rourke Decmil Hutchinsons Lendlease John Holland Group Thiess Brookfield Multiplex BGC Group (Australia) Leighton Contractors Watpac Australia Downer EDI Works Pow Water Corp NT Sydney Water Corp 	<ul style="list-style-type: none"> Civil Contractors Federation (CCF) Austroads Australian Constructors Association Institute of Public Works Engineering Australasia (IPWEA) Australian Asphalt Pavement Association (AAPA) National Utility Locating Contractors Association (NULCA) Construction Industry Training Board (SA) Construction Forestry Maritime, Mining & Energy Union (CFMMEU) Australian Workers' Union (AWU) 	<ul style="list-style-type: none"> Enterprise RTOs Private and Community RTOs Technical and Further Education institutions (TAFEs) 	<ul style="list-style-type: none"> State Road and Traffic Authorities Safe Work Australia WorkSafe QLD WorkSafe TAS WorkSafe VIC NT WorkSafe SafeWork NSW SafeWork SA Worksafe WA Access Canberra

6.1.4 Scope of project

1. Update 167 of 167 UoCs specific to the Civil Infrastructure sector with the following criteria:

- Update the content of 167 UoCs for currency where UoCs do not match the skills needs of current Civil Infrastructure technologies due to recent advancements in the industry, such as new road pavement methods, pre-fabrication and remote controlled plant and equipment (Driver for change 1).
- Update the content of 167 UoCs for currency to health, safety and environmental work practices, contextualised to each task, such as working at heights, to ensure uniformity across the industry (Driver for change 2).
- Review for deletion 5 UoCs in order to reduce duplication and overlapping content in training products (Driver for change 3).

2. Create 2 UoCs to address the knowledge and experience gap in operating tunnel boring machines (Driver for change 1).

3. Update 11 of 11 qualifications related to Civil Infrastructure with the following criteria:

- Update packaging rules of 11 qualifications to ensure alignment to occupations (Driver for change 3).
- Incorporate new UoCs and delete obsolete UoCs from the packaging rules of 11 qualifications due to new technology and methods replacing those that are obsolete in the industry (Driver for change 1).

6.2 Project 3B: Metalliferous mining and resource processing

The object of this project is to update metalliferous mining and resource processing qualifications and UoCs to align training standards to current job roles and responsibilities in the sector. Changes would allow learners to specialise in specific metalliferous mining or resource processing roles to allow clearer career pathways.

6.2.1 Rationale

Job roles affected

This project will impact job roles of workers in metalliferous mining, and resource processing across both coal and metalliferous sectors. This includes roles of operators, processing technicians, supervisors, registered managers, underground mine managers, processing operations superintendents and production superintendents.

Drivers for change

Industry consultations supported the need to update metalliferous mining and resource processing qualifications and UoCs to reflect:

1. Clarifying **pathways** in the industry to allow for increased recognition and specialisation for particular roles in the industry (e.g. dry, wet and chemical processing and tailoring packaging rules to the current role of a supervisor – particularly in resource processing).
2. Updating training products on tailings dams to ensure they are current to industry standards on **health, safety and environmental** concerns.
3. Updating packaging rules to accommodate **new and emerging technologies** and other new competencies and updating the packaging rules for irrelevant competencies currently in the qualifications.
4. Deleting the Certificate III in Small Mining Operations, Diploma of Minerals Processing, Diploma of Underground Metalliferous Mining Management and Advanced Diploma of Metalliferous Mining as these qualifications are evidently **no longer required for job roles**.

Current training products

There are ten qualifications from Certificate II to Diploma level for Resource Processing and Certificate II to Advanced Diploma level relating to Metalliferous Mining and 103 UoCs, which were last updated in December 2015 by SkillsDMC.

There are ten qualifications and nine UoCs identified in consultations that require amendment, with four qualifications proposed for deletion due to low enrolments and industry uptake.

Demand for training product change

Create clearer pathways by updating the qualifications' packaging rules

Stakeholder feedback from consultations have highlighted that current nationally recognised training products do not show clear pathways for the metalliferous mining and resource processing sectors. To assist with this, stakeholders have suggested:

- **Updating the Certificate III in Resource Processing to create job role streams for dry, wet and chemical processing:** Feedback suggests that creation of job role streams would allow learners to deepen their expertise to better prepare learners for the workplace. This is important given these areas of processing require different skills and knowledge. For instance, wet processing requires several steps including crushing, screening, flotation and concentration, however dry processing only requires crushing and screening.⁶⁷ Additionally, an increasing need for lithium processing expertise has sparked calls from industry to ensure training products in chemical processing meet the need of this new area in the industry.

- **Updating the Certificate IV in Resource Processing to align to the role of a Resource Processing Supervisor role and incorporating more business skills and non-technical skills for the Certificate IVs:** Industry feedback in Resource Processing indicated the Certificate IV and Diploma are generally not used by the industry with the Certificate III being preferred for all roles. This is despite supervisory positions having higher job functions than operators in regards to hazard risk management, preparing, maintaining and supervising plant, optimising the utilisation of plant and workers, supervising multiple processes and conducting business and compliance reporting activities. Given this, industry supports the need to update the Certificate IV with the aim to create industry standards for supervisors, to improve learning outcomes and decrease incidents in this hazardous work environment. Similarly, feedback was frequently obtained that supervisors in metalliferous mining needed the option to acquire skills to perform these functions, particularly for smaller operations in the industry. Industry highlighted the need to ensure the packaging rules of the Certificate IVs appropriately incorporate skills for supervisory roles.

Updating tailings dams training products to ensure industry needs are reflected

Recent attention to international incidents of tailings dam failures (e.g. the Vale incident in Brazil) has spurred action by mining companies to ensure work practices in this area are up to standard. Similarly, regulators have recently issued standards covering management of tailings storage facilities.⁶⁸ Industry has indicated a need to update existing competencies on tailings dams to ensure they are meeting current industry needs and regulations.

Updating packaging rules and UoCs for currency

Industry has highlighted the need for new competencies on remote operating centres, remote vehicle operations, autonomous vehicles and drones to be included within metalliferous mining qualifications. It should be noted that the creation of these units currently sits in the New and Emerging Technologies project, however given the current impact of these technologies in the Metalliferous sub-sector, this proposed project will be combined with the existing project to create these units. The development and inclusion of these units is to occur with an update over packaging rules with the view to include non-technical competencies being updated in the Supervisors and Common Skills projects. Stakeholders also identified irrelevant skills to be removed in some of the qualifications, for instance the Certificate III in Resource Processing contains Mobile Plant Operations UoCs that are not relevant to the job role, e.g. Conduct articulated and rigid haul truck operations (RIIMPO337E and RIIMPO338E) are not relevant to roles undertaking this qualification.

Removing qualifications that are no longer required for job roles

Enrolments in current versions of the Certificate III in Small Mining Operations, Diploma of Metalliferous Mining Operations and Advanced Diploma of Metalliferous Mining were nil for 2014 through to 2017. Industry feedback indicates these qualifications are currently not required for job roles in this sector. The Certificate III in Small Mining Operations currently has two enrolments and one RTO with the qualification on scope. Stakeholders have indicated that the qualification is used for acquiring rehabilitation skills and would be better considered as a skill set rather than a qualification. More senior roles (e.g. mine manager roles) are acquired through experience and through satisfying a statutory exam or through attaining a Bachelor's Degree or Diploma in Mining Engineering.⁶⁹ Similarly, stakeholders indicated the Diploma in Resource Processing is not used (with the Certificate III used by most professionals in the industry), having zero enrolments from 2014 to 2017.

6.2.2 Ministers' Priorities

The Ministers' priorities addressed by this project are as follows:

- **Obsolete and duplicate qualifications are removed from the system.** Updating the packaging rules and removing obsolete qualifications would provide clearer pathways for learners and equip them with the relevant skills for the entering the workforce.
- **Foster greater recognition of skill sets.** This project addresses the high demand for skill sets across the MDCl industry in metalliferous mining and resource processing in order to future-proof the existing workforce.

Additionally, **improved efficiency of the training system through UoCs that can be owned and used by multiple industry sectors** was considered in the development of this project but was unable to be addressed. The enhancements to this Training Package requires the development of metalliferous mining and resource processing specific UoCs in order to meet industry needs. These UoCs cannot be used across multiple sectors.

6.2.3 Consultation Plan

PwC's Skills for Australia intends to engage a wide range of stakeholders in the Metalliferous Mining and Resource Processing sectors, targeting professionals in metalliferous mining, wet, dry and chemical processing and resource processing professionals in coal and metalliferous sectors.

Representation across industry, peak bodies, government and regulatory bodies, employee associations and registered training organisations will be consulted for the project, via a number of methods including:

- A Project Working Group (PWG) with experienced representatives from industry
- Focus Groups and open forums across a variety of states and regions
- Targeted one on one consultations
- Online nationwide survey(s).

Stakeholders to be consulted with include, but are not limited to:

Employers	Industry associations/Peak bodies & Unions	Registered Training Organisations	Public/Government bodies
<ul style="list-style-type: none"> • BHP • MMG Limited • OZ Minerals • Rio Tinto • Lithium Australia • South32 Ltd • Glencore • Gold Corporation • Fortescue Metals • Newmont Mining • Kalgoorlie Consolidated Gold Mines • Aus Tin Mining • Iluka Resources • Newmont Mining • TAS Advanced Minerals Mine 	<ul style="list-style-type: none"> • Australian Mines and Metals Association (AMMA) • Australian Mining Association (AMA) • Resources and Infrastructure NSW ITAB • METSIgnited & National Energy Resources Australia (NERA) • Mining and Petroleum Competence Boards of NSW and QLD • Worksafe Connect • Construction Forestry Maritime, Mining & Energy Union (CFMMEU) • Australian Workers' Union (AWU) 	<ul style="list-style-type: none"> • Enterprise RTOs • Private and Community RTOs • Technical and Further Education institutions (TAFEs) 	<ul style="list-style-type: none"> • Department of Natural Resources, Mines and Energy (QLD) • Department of Mines and Petroleum (WA) • NSW Department of Industries - Resources & Energy (NSW)

6.2.4 Scope of Project

1. Update 6 of 10 qualifications related to metalliferous mining and resource processing with the following criteria:

- Update 1 qualification (RII30415 Certificate III in Resource Processing) to include streams for dry, wet and chemical processing (Driver for change 1)
- Update 2 qualifications (RII40315 Certificate IV in Metalliferous Mining Operations (Underground) and RII40515 Certificate IV in Resource Processing) to clarify and strengthen pathways (Driver for change 1)

- c. Update 6 qualifications to incorporate new UoCs on new and emerging technologies relevant to metalliferous mining and resource processing (Driver for change 3).
2. **Update 3 UoCs relating to tailings dams to ensure they are in line with industry standards and recently instituted regulatory guidance (Driver for change 3).**
3. **Review for deletion 4 qualifications (RII30615 Certificate III in Small Mining Operations, RII50215 Diploma of Underground Metalliferous Mining Management, RII50315 Diploma of Minerals Processing and RII60115 Advanced Diploma of Metalliferous Mining) as they are no longer relevant for the metalliferous mining and resource processing sectors (Driver for change 4).**
4. **Review for deletion 6 UoCs relating to small mining operations due to low enrolments.**

6.3 Project 3C: Extractive

The object of this project is to update the surface extraction qualifications to ensure alignment to current job roles. The project intends to update UoCs to reduce duplication in the Training Package, and to ensure industry standards are elevated in high profile areas such as ground control (including geotechnical awareness) and dust management, in addition to incorporating non-technical and new industry skills by optimising the packaging rules.

6.3.1 Rationale

Job roles affected

The Extractive Industries sector broadly encompasses three sub-sectors of practice. These are surface/open cut coal mining, surface/open cut metalliferous mining and quarrying. While there are many similarities between the job roles and skills required to work across surface/open cut mining and quarrying, IRC members note that industry views these sub-sectors as distinct from one another, given differences in their risk profile and product end uses. Therefore, this case for change acknowledges that while similarities exist across skills needs in surface/open cut mining and quarrying, training product development should also reflect that there are differences depending on the context in which these skills are applied. Job roles in these sub-sectors affected by this project are plant operators, tradespeople, mining and quarry supervisors, mining engineering managers, mine managers, quarry managers and quarry area managers working in the above sectors.

Drivers for change

The following drivers for change were identified during consultations for this project:

1. Skills gaps in work practices to mitigate **health, safety and environmental** concerns (such as planning and construction for dumps, dust risk management and ground instability control) were identified by stakeholders
2. Industry supports **clarifying and strengthening pathways** in the sector through updating the qualifications and ensuring the right competencies are available at the right levels and more senior roles have an appropriate mix of technical, inter-personal and business skills
3. Updates to the packaging rules will be required for new competencies on **new and emerging technologies** that are being created and updated in ongoing PwC's Skills for Australia projects, to reflect new and changing roles in extractives
4. Consolidations to six Stockpile and Reclaim Material UoCs were recommended to **reduce duplication and overlap** in the Training Package.

Current training products

There are five qualifications (Certificate II to Certificate IV in Surface Extraction Operations, Diploma of Surface Operations Management and Advanced Diploma of Extractives Industries Management) and ten UoCs in scope for this project, which were last updated in December 2015 by SkillsDMC.

Enrolment numbers for the Certificates II and III in the industry were strong in 2017 at 12,345 and 17,290 respectively, while enrolments in the Certificate IV, Diploma and Advanced Diploma were at 255, 175 and 60 respectively. With relatively robust but tapering enrolment numbers at higher AQF level qualifications in the extractives industry, stakeholders have recommended updating the qualifications to ensure pathways are clear and flexibility is allowed where regulations on supervisory positions in the industry differ for each State/Territory.

Demand for training product change

Skills gaps exist in dump planning and construction, dust risk management and at senior levels for controlling ground instability risks

Stakeholder feedback from consultations have highlighted that there are apparent skills gaps that are required to be filled in the industry in regards to:

- **Planning and construction of dumps** – Recent fatalities and serious injuries in Victoria have created an industry need for units to address a skills gap in the safe and effective planning and construction of dumps and associated work activities.⁷⁰
- **Ground stability** – Insufficient training products exists in the Training Package for management levels in implementing ground control plans. A new UoC was recommended by stakeholders and should align to regulatory codes of practice recently released by state regulators,⁷¹ and packaging rules of relevant qualifications be reviewed to include appropriate ground stability competencies.
- **Dust management** – Since 2015, there have been 97 reported cases of dust lung diseases in Queensland alone, including 35 cases of coal workers pneumoconiosis (otherwise known as black lung disease).⁷² This has created a push from industry to update existing UoCs on dust suppression (e.g. RIIMEX201D Suppress dust in an open cut environment). This is to ensure that the skills outlined in the competencies cover multiple types of controls for these hazards and are included within all relevant qualifications at a Certificate II and III level.

Additionally, dredging UoCs were recommended to be updated due to knowledge and skills gaps in plant and equipment capabilities and recognising bank instability. Similarly, stockpile management competencies are required to be updated to reflect current practice on geotechnical hazards, traffic management, product specifications and behaviour and methods of measuring stockpile quantities.

There is a need to create clearer pathways by updating packaging rules

Stakeholder feedback from consultations have highlighted that current nationally recognised training products do not show clear pathways for the quarrying sector. To assist with this, stakeholders have suggested that business skills and other non-technical skills should be incorporated into Certificate IV, Diploma and Advanced Diploma qualifications. Many supervisors are required to undertake a number of business functions, such as key metrics and business reporting and budgeting activities using computers. Currently, the Certificate IV, Diploma and Advanced Diploma do not cater for these additional non-technical skills. Industry has suggested to update the qualifications to incorporate more of UoCs from other Training Packages, such as the Business Services (BSB) Training Package covering these skills to ensure they have the relevant skills before moving into these roles.

Packaging rules should be updated to reflect new competencies required by extractive roles

Industry has highlighted the need for new competencies on remote operating centres, remote vehicle operations, autonomous vehicles and drones (which are to be explored in Project 3B: Metalliferous Mining and Resource Processing) to be included within extractive industries qualifications. This is to occur with an update of packaging rules with the view to include non-technical competencies being updated in the Supervisors and Common Skills projects.

Recommendations to mitigate duplication and overlap in the package were supported by stakeholders

Industry stakeholders also supported combining UoCs within the Stockpile and Reclaim Material unit grouping to eliminate duplication and increase clarity for learners undertaking Surface Extraction qualifications.

6.3.2 Ministers' Priorities

The Ministers' priorities directly addressed by this project are as follows:

- **More information about industry's expectations of training delivery is available to training providers to improve their delivery and to consumers to enable more informed choices.** Training Package components in this project will be written so they align with industry expectations for training delivery, specifically around practical experience, and will be released with an RII Companion Volume that provides additional information.
- **Foster greater recognition of skill sets.** In order to future-proof the existing workforce, this project addresses the high demand for skill sets across the MDCI sector in relation to conducting planning and construction for dumps, dust risk management and the gaps at senior levels for controlling ground stability risks.

6.3.3 Consultation Plan

PwC's Skills for Australia intends to engage a wide range of stakeholders in Extractive Industries, targeting professionals in open cut/surface coal mining, open cut/surface metalliferous mining and quarrying.

Representation across industry, peak bodies, government and regulatory bodies, employee associations and registered training organisations will be consulted for the project, via a number of methods including:

- A Project Working Group (PWG) with experienced representatives from industry
- Focus Groups and open forums across a variety of states and regions
- Targeted one on one consultations
- Online nationwide survey(s).

Stakeholders to be consulted with include, but are not limited to:

Employers	Industry associations/Peak bodies & Unions	Registered Training Organisations	Public/Government bodies
<ul style="list-style-type: none"> • Boral Resources • Hanson • Holcim • WA Limestone Group • Sibelco Asia Pacific • Cristal Australia • Iluka Resources • Tronox Limited • BHP • Glencore • Boadicea Resources • Newmont Mining Corporation • Nucrush 	<ul style="list-style-type: none"> • Institute of Quarrying Australia (IQA) • Construction Material Processors Association (CMPA) • Resources Industry Training Council (RITC) • Victorian Limestone Producers Association • NSW & QLD Mining and Petroleum Competence Boards • Construction Forestry Maritime, Mining & Energy Union (CFMMEU) • Australian Workers' Union (AWU) 	<ul style="list-style-type: none"> • Enterprise RTOs • Private and Community RTOs • Technical and Further Education institutions (TAFEs) 	<ul style="list-style-type: none"> • Department of Natural Resources, Mines and Energy (QLD) • Department of Mines and Petroleum (WA) • NSW Department of Industries - Division of Resources & Energy (NSW)

6.3.4 *Scope of Project*

1. Update 5 of 5 qualifications related to the extractives industry with the following criteria:

- a. Update all 5 qualifications to optimise the packaging rules and to assist with clarifying roles in the sector (Driver for change 2), namely: RII20215 Certificate II in Surface Extraction Operations; RII30115 Certificate III in Surface Extraction Operations; RII40115 Certificate IV in Surface Extraction Operations; RII50115 Diploma of Surface Operations Management; and RII60215 Advanced Diploma of Extractive Industries Management
- b. Update 3 qualifications to reflect the need in industry for stronger interpersonal and business skills (Driver for change 2), namely: RII40115 Certificate IV of Surface Extraction Operations, RII50115 Diploma of Surface Operations Management and RII60215 Advanced Diploma of Extractive Industries Management
- c. Update all 5 qualifications to incorporate new UoCs in emerging technologies, geotechnical risks and other areas being developed in ongoing projects (Driver for change 3).

2. Update 10 of 39 UoCs related to the extractive sector, with the following criteria:

- a. Update 6 UoCs with a view to amalgamate them to reduce duplication and overlap in training products (Driver for change 4)
- b. Update 2 UoCs for required knowledge of operational techniques including plant and equipment capabilities and knowledge of signs of bank instability (Driver for change 1)
- c. Update 1 UoC on dust suppression to reflect current industry practices (Driver for change 1)
- d. Update 1 UoC on stockpile management to reflect increased required knowledge requirements for roles undertaking this course (Driver for change 1).

3. Create 2 new UoCs to fulfil a skills gap in planning and construction of dumps and implementing a ground control management plan (Driver for change 1).

7 IRC Sign off

The Industry Skills Forecast and Proposed Schedule of Work was agreed to by:

				
Tanja Conners	Darryl Cooper	Tim Westcott	Mark Knowles	Elizabeth Gibson
Chair	Chair	Chair	Chair	Chair
Civil Infrastructure IRC	Coal Mining IRC	Drilling IRC	Metalliferous Mining IRC	Extractive IRC
26 th May 2018	26 th May 2018	26 th May 2018	26 th May 2018	26 th May 2018

A large offshore oil rig is silhouetted against a bright orange sunset sky. The rig's complex structure, including its derrick and various platforms, is clearly visible. The sun is low on the horizon, creating a strong glow. The ocean surface is dark with some whitecaps.

Appendices

Appendix A

Administrative Information

About PwC's Skills for Australia

PwC's Skills for Australia supports the Mining, Drilling and Civil Infrastructure IRCs. As a Skills Service Organisation (SSO), PwC's Skills for Australia is responsible for working with industry and our IRCs to:

- Research what skills are needed in our industries and businesses, both now and in the future, to provide the right skills to match our job needs; helping us to stay at the forefront of global competitiveness and support continued economic prosperity.
- Identify and understand current and emerging trends in the global and domestic economy and how they impact on Australia's skills needs.
- Revise our vocational qualifications and training content to better match what people will learn with the skills needs of our industries and businesses, giving our population the best possible chance of developing work ready skills.

About the Industry Reference Committees

The MDCI IRCs contain the following members, as at March 2019:

- Civil Infrastructure IRC – 13 members
- Coal Mining IRC – 15 members
- Drilling IRC – 12 members
- Extractive Industries IRC – 11 members
- Metalliferous Mining IRC – 12 members.

Table 3: MDCI IRC membership

Name	Organisation	Category	IRC role
Civil Infrastructure			
Tanja Conners	Australian Asphalt and Paving Association (AAPA)	Peak Body	IRC Chair
Tony Boulderstone	Self employed	Individual with expertise in road construction and maintenance including road marking	IRC Deputy Chair
Damian Long	Civil Contractors Federation (CCF)	Peak Body	IRC Member
Craig Moss	Institute of Public Works Engineering Australasia (IPWEA)	Peak Body	IRC Member
Hannah Sauvarin	Roads Australia	Peak Body	IRC Member
Keith McIlwain	McIlwain Civil Contractors	Individual with expertise in civil foundations	IRC Member
TBC	TBC	Individual with expertise in bridge and/or tunnel construction	IRC Member
Paul Casey	Roadworks Solutions	Individual with expertise in traffic management	IRC Member

Name	Organisation	Category	IRC role
Philip Cassell	Eco Group	Individual with expertise in plant operation	IRC Member
Shane Roulstone	Australian Workers Union (AWU)	Employee association	IRC Member
Stuart Maxwell	Construction, Forestry, Maritime, Mining and Energy Union (CFMMEU)	Employee association	IRC Member
Trevor Gosatti	Australasian Society for Trenchless Technology	Peak Body	IRC Member
Yvonne Webb	Industry Skills Advisory Council	State industry training advisory body	IRC Member
Coal Mining			
Darryl Cooper	Minerals Council of Australia (MCA)	National peak body	IRC Chair
Greg Dalliston	Construction, Forestry, Maritime, Mining and Energy Union (CFMMEU)	Employee association	IRC Deputy Chair
Andrew Palmer	NSW Mining and Petroleum Competence Board	State agencies / regulators	IRC Member
Barry Watson	Australian Workers' Union (AWU)	Employee association	IRC Member
Brant Softley	Australian Manufacturing Workers' Union (AMWU WA Branch)	Employee association	IRC Member
Christine Lindsey	Oil, Gas and Energy Resources Growth Centre – National Energy Resources Australia (NERA)	Industry Growth Centre	IRC Member
Doug Kennedy	Glencore	Individual with expertise in underground coal mining	IRC Member
Duncan Campbell	Ensham Resources	Individual with expertise in underground coal mining	IRC Member
Kamball Schafferius	Orica	Individual with blasting expertise	IRC Member
Mark Freeman	QLD Mines Rescue	Mines rescue services	IRC Member
Michael Hall	AGL Energy Ltd	Individual with expertise in surface coal mining	IRC Member
Rod van Moolenbroek	Sedgman	Individual with expertise in coal processing	IRC Member
Stephen Smith	QLD Mines Inspectorate	State agencies / regulators	IRC Member
Scott Layton	BHP	Individual with expertise in surface coal mining	IRC Member
Shane Apps	QLD Resources Council	State minerals council	IRC Member
Drilling			
Tim Westcott	TDW Consulting Pty Ltd/Australian Drilling Industry Association	Industry expertise Blast hole drilling	IRC Chair
David Meesey	Savanna Energy	Industry expertise Oil and gas drilling, including well servicing	IRC Deputy Chair
Andrew Ogden	Western Irrigation	Industry expertise Water well drilling	IRC Member
TBC	TBC	Industry expertise Construction-related drilling	IRC Member
Michelle Carey	METSIgnited & National Energy Resources Australia (NERA)	Industry Growth Centre	IRC Member
Peter Hall	Australian Drilling Industry Association	Peak body	IRC Member
TBC	TBC	Industry expertise Mineral exploration drilling	IRC Member
Phillip de Courcey	Resources and Engineering Skills Alliance (RESA)	State industry training advisory body	IRC Member
Rob Wallace	Australasian Assurance Services	Industry Expertise Drilling safety	IRC Member

Name	Organisation	Category	IRC role
Ross Pickering	HMR Drilling	Industry expertise Underground drilling	IRC Member
Steven Mathams	Drillpower QLD	Industry Expertise Geotechnical/environmental drilling	IRC Member
Waeel Ilahi	WA Department of Mines, Industry Regulation and Safety (DMIRS)	State regulator	IRC Member
Extractive Industries			
Elizabeth Gibson	Construction Material Processors Association (CMPA)	State association	IRC Chair
Wesley Woodman	Holcim	Industry expertise Large operating industry enterprise	IRC Deputy Chair
Fiona Petty	Nucrush Group	Industry expertise Small or independent enterprise	IRC Member
Glenn McLaren	Australian Manufacturing Workers' Union (AMWU)	Employee association	IRC Member
Kamball Schafferius	Orica	Individual with expertise in blasting	IRC Member
Kylie Fahey	Institute of Quarrying Australia (IQA)	Peak body	IRC Member
Luke Tavener	Boral	Industry expertise Large operating industry enterprise	IRC Member
Maria Floro	Hanson	Industry expertise Large operating industry enterprise	IRC Member
Sean Burke	Australian Workers' Union (AWU)	Employee association	IRC Member
Waeel Ilahi	WA Department of Mines, Industry Regulation and Safety (DMIRS)	State regulator	IRC Member
TBC	Cement and Concrete Aggregates Association (CCAA)	Peak body	IRC Member
Metalliferous Mining			
Mark Knowles	Independent consultant	Industry expertise Resource processing	IRC Chair
Aaron Gray	Rio Tinto	Statutory positions and/or mine management	IRC Deputy Chair
Annie Holt	Chamber of Minerals and Energy WA (CMEWA)	State minerals councils/ chambers	IRC Member
Darryl Cooper	Minerals Council of Australia (MCA)	Industry expertise Underground mining	IRC Member
Glenn McLaren	Australian Manufacturing Workers' Union (AMWU)	Employee association	IRC Member
Greg Burke	Minerals Council of Australia	National peak body	IRC Member
Jodie Badcock	Mining, Equipment, Technology and Services Growth Centre (METS Ignited)	Industry growth centre	IRC Member
Kamball Schafferius	Orica	Individual with expertise in blasting	IRC Member
Martin Ralph	WA Department of Mines, Industry Regulation and Safety (DMIRS)	State regulator	IRC Member
Nigel Haywood	Resources Industry Training Council	State industry training advisory body or equivalent	IRC Member
Shane Roulstone	Australian Workers' Union (AWU)	Employee association	IRC Member
Vicki Anderson	Mount Isa Mines	Industry expertise Surface mining	IRC Member

Appendix B

MDCI Training Package profile

There are 53 qualifications in the RII Training Package. Of the 4.2 million learners enrolled in vocational education qualifications in 2017, there were 85,015 learners enrolled in the RII Training Package, comprising 2 per cent of all learners.⁷³ Table 4 shows the number of enrolments in all MDCI qualifications.

Table 4: Scale of qualification involvement

Qualifications	2017 Enrolments
Civil infrastructure	
Certificate II in Civil Construction	2,820
Certificate II in Bituminous Surfacing	-
Certificate III in Civil Construction Plant Operations	26,835
Certificate III in Civil Construction	8,785
Certificate III in Civil Foundations	15
Certificate III in Road Construction and Maintenance	5
Certificate III in Trenchless Technology	190
Certificate IV in Civil Construction Operations	60
Certificate IV in Civil Construction Supervision	1,565
Certificate IV in Civil Construction Design	90
Diploma of Civil Construction Management	95
Diploma of Civil Construction Design	440
Advanced Diploma of Civil Construction Design	35
Advanced Diploma of Civil Construction	20
Coal Mining	
Certificate II in Underground Coal Mining	770
Certificate III in Underground Coal Operations	240
Certificate IV in Surface Coal Mining (Open Cut Examiner)	740
Certificate IV in Underground Coal Operations	175
Diploma of Underground Coal Mining Management	25
Advanced Diploma of Underground Coal Mining Management	5
Advanced Diploma of Surface Coal Mining Management	10
Drilling	
Certificate II in Drilling Operations	610
Certificate II in Drilling Oil/Gas (On Shore)	1,520
Certificate II in Well Servicing Operations	360
Certificate III in Resource Processing	985
Certificate III in Drilling Operations	460
Certificate III in Drilling Oil/Gas (On Shore)	40
Certificate III in Well Servicing Operations	180
Certificate IV in Resource Processing	30
Certificate IV in Drilling Operations	110
Certificate IV in Drilling Oil & Gas (On Shore)	40
Certificate IV in Well Servicing Operations	100
Diploma of Drilling Operations	15
Diploma of Drilling Oil & Gas (On Shore)	35
Diploma of Well Servicing Operations	75

Advanced Diploma of Drilling Management	-
Extractive Industries	
Advanced Diploma of Extractive Industries Management	60
Metalliferous mining	
Certificate II in Underground Metalliferous Mining	295
Certificate III in Underground Metalliferous Mining	300
Certificate IV in Metalliferous Mining Operations (Underground)	160
Advanced Diploma of Metalliferous Mining	-
Cross sector	
Certificate I in Resources and Infrastructure Operations	480
Certificate II in Resources and Infrastructure Work Preparation	3,925
Certificate II in Surface Extraction Operations	12,345
Certificate II in Resource Processing	565
Certificate II in Cross Industry Operations	10
Certificate III in Surface Extraction Operations	17,290
Certificate III in Mining Exploration	145
Certificate III in Mine Emergency Response and Rescue	1,530
Certificate IV in Surface Extraction Operations	255
Diploma of Surface Operations Management	175
Diploma of Minerals Processing	-

Source: NCVER (2018) *Total VET students and courses*

Appendix C

Stakeholder consultations

As summarised in Section 4, the consultation approach to developing this proposed schedule of work included individual consultations, group consultations, a public survey and written submissions. The stakeholders who were consulted during the development of the projects are detailed in Table 5 below. Additionally, a draft version of this report was provided to all state and territory training authorities (STAs) and feedback was received and incorporated from STAs in New South Wales, Victoria and Queensland.

Although not explicitly called out as stakeholders consulted in the table below, this document and proposed project details has also relied on subject matter expertise gained from structured interviews, discussion in meetings and feedback on drafts of this document from members of the MDCI IRCs. These IRC members are from across jurisdictions and stakeholder types.

During our consultation process, attempts were made to cover all jurisdictions and stakeholder types. However, stakeholders were more readily available in regions where this training is currently delivered and where employment in the relevant sector is. Comparative size of the relevant sector is also a factor in the availability of stakeholders.

It is acknowledged that additional consultation will be conducted in future project work to continue to refine stakeholder opinions and to determine specific changes required to training products.

Table 5: List of stakeholders consulted during the development of the projects proposed for 2019-20

Organisation	State	Stakeholder type	Project	Consultation method
AWU	NSW	Union	Metalliferous Mining and Resource Processing	Survey
AWU	NSW	Union	Metalliferous Mining and Resource Processing	Survey
BHP	QLD	Industry	Extractive	Focus Group
BHP	WA	Employee	Metalliferous Mining and Resource Processing	Survey
BHP Nickel West	WA	Industry	Metalliferous Mining and Resource Processing	Survey
BHP/BMA	QLD	Industry	Extractive	Focus Group
Boral	NSW	Industry	Extractive	Interview
Boral	NSW	Industry	Extractive	Interview
Boral	TAS	Industry	Extractive	Email
Cape Crushing	WA	Industry	Civil Infrastructure	Interview
Carpentaria Gold	QLD	Industry	Metalliferous Mining and Resource Processing and Extractive	Survey
CCF	NSW	Peak body	Civil Infrastructure	Interview
Centennial Coal	NSW	Industry	Extractive	Survey
Centennial Coal	NSW	Industry	Metalliferous Mining and Resource Processing	Survey
CFMMEU	QLD	Union	Extractive	Focus Group
Charles Darwin University	NT	RTO	Metalliferous Mining and Resource Processing	Survey
Decmil	VIC	Industry	Civil Infrastructure	Interview
Decmil	VIC	Industry	Civil Infrastructure	Interview

Department of Natural Resources Mines & Energy Queensland (DNRME QLD)	QLD	Regulator	Metalliferous Mining and Resource Processing	Survey
DNRME QLD	QLD	Regulator	Metalliferous Mining and Resource Processing and Extractive	Interview
Downer Pipetech	NSW	Industry	Civil Infrastructure	Survey
Dyno Nobel Asia Pacific	QLD	Industry	Extractive	Survey
Eco Group	QLD	Industry	Civil Infrastructure	Interview
Evolution Mining	QLD	Industry	Extractive	Survey
Evolution Mining	WA	Industry	Metalliferous Mining and Resource Processing and Extractive	Survey
Evolution Training and Safety	QLD	RTO	Civil Infrastructure	Interview
FKG Group	QLD	RTO	Civil Infrastructure	Interview
Fortescue Metals	WA	Industry	Metalliferous Mining and Resource Processing and Extractive	Interview
Fulton Hogan	QLD	Industry	Civil Infrastructure	Interview
Fulton Hogan	VIC	Industry	Civil Infrastructure	Interview
Glencore	QLD	Industry	Extractive	Focus Group
Glencore	NSW	Industry	Extractive	Survey
Glencore	NSW	Industry	Metalliferous Mining and Resource Processing	Interview
Glencore	QLD	Industry	Metalliferous Mining and Resource Processing	Survey
Glencore	QLD	Mining	Metalliferous Mining and Resource Processing	Survey
Glencore	NSW	Industry	Extractive	Survey
Glencore	QLD	Industry	Extractive	Focus Group
Glencore	QLD	Industry	Metalliferous Mining and Resource Processing	Survey
Hanson	NSW	Industry	Extractive	Email feedback
Holcim	NSW	Industry	Extractive	Survey
Iluka Resources	WA	Industry	Metalliferous Mining and Resource Processing	Interview
Incitec Pivot Ltd	QLD	Industry	Metalliferous Mining and Resource Processing	Survey
John Holland	NSW	Industry	Civil Infrastructure	Interview
Kajaria Pty Ltd	WA	RTO	Civil Infrastructure	Interview
Laing O'Rourke	NSW	Industry	Civil Infrastructure	Interview
Lendlease	VIC	Industry	Civil Infrastructure	Interview
McIlwain Contractors	QLD	Industry	Civil Infrastructure	Interview
McIlwain Contractors	QLD	Industry	Civil Infrastructure	Interview
McMahon Contracting	WA	Industry	Metalliferous Mining and Resource Processing	Interview
Mount Isa Mines	QLD	Mining	Metalliferous Mining and Resource Processing	Survey
North Metropolitan TAFE	WA	RTO	Metalliferous Mining and Resource Processing	Survey
Northern Star Resources	WA	Industry	Metalliferous Mining and Resource Processing	Survey
Northparkes Mines	NSW	Industry	Metalliferous Mining and Resource Processing	Survey
NRTafe	WA	RTO	Extractive	Survey
NSW Mining and Petroleum Competence Board	NSW	Regulator / Government	Extractive	Focus Group
NSW Resources Regulator	NSW	Industry	Extractive	Focus Group
Octec	NSW	RTO	Civil Infrastructure	Interview
Orica	VIC	Industry	Metalliferous Mining and Resource Processing and Extractive Industries	Survey
Own Consultancy	VIC	Industry	Extractive	Interview, survey

Own Consultancy	VIC	Industry	Extractive	Email feedback
People & Process Solutions	NSW	Industry	Metalliferous Mining and Resource Processing	Survey
Pioneer North Queensland	QLD	Industry	Extractive Industries	Survey
QCoal	QLD	Industry	Metalliferous Mining and Resource Processing	Interview
Queensland Mines Rescue	QLD	Peak body	Extractive	Focus Group, Survey
Redpath Mining	QLD	Mining Contractor	Metalliferous Mining and Resource Processing	Survey
Resources and Engineering Skills Alliance	SA	Peak body	Metalliferous Mining and Resource Processing and Extractive Industries	Email feedback
Resources Industry Training Council	WA	Peak body	Civil Infrastructure	Interview
Right Work Dynamics	NSW	Industry	Civil Infrastructure	Interview
Rio Tinto	WA	Industry	Metalliferous Mining and Resource Processing	Interview
Rio Tinto Weipa	QLD	Industry	Extractive	Survey
Rio Tinto Yarwun	QLD	Industry	Metalliferous Mining and Resource Processing	Survey
Self Employed	WA	Industry	Metalliferous Mining and Resource Processing	Survey
Signature Learning	NSW	RTO	Civil Infrastructure	Interview
Site Skills Training	WA	RTO	Civil Infrastructure	Interview
South Metro Tafe	WA	RTO	Civil Infrastructure	Email feedback
Sydney Metro	NSW	Industry	Civil Infrastructure	Group teleconference
TAFE NSW	NSW	RTO	Civil Infrastructure	Interview
TAFE NSW	NSW	RTO	Civil Infrastructure	Group teleconference
TAFE NSW	NSW	RTO	Civil Infrastructure	Group teleconference
TAFE NSW Skillspoint HQ	NSW	RTO	Civil Infrastructure	Group teleconference
TAS Advanced Minerals Mine	TAS	Industry	Metalliferous Mining and Resource Processing	Interview
TasTAFE	TAS	RTO	Metalliferous Mining and Resource Processing	Interview
Tritton Mine	NSW	Industry	Metalliferous Mining and Resource Processing	Survey
Vac Group	QLD	Industry	Civil Infrastructure	Interview
Western Australian Department of Mines, Industry Regulation and Safety	WA	Regulator / Government	Metalliferous Mining and Resource Processing and Extractive	Interview
Western Australian Department of Mines, Industry Regulation and Safety	WA	Regulator / Government	Metalliferous Mining and Resource Processing and Extractive	Interview
Whitehaven Coal	NSW	Industry	Extractive Industries	Survey
WorkSafe Connect	QLD	RTO	Civil Infrastructure, Metalliferous Mining and Resource Processing and Extractive	Interview

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 - ⁴ Victoria state Government (2018) *Management of Tailings Storage Facilities*
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