

Workforce study for the Resources Sector in the Eyre Peninsula

Prepared for
The South Australian Training and Skills Commission

by
Resources and Engineering Skills Alliance (RESA)

in collaboration with
Innovation Economics



RESA
Unearthing Skills
Solutions



**Government
of South Australia**

Training and Skills Commission



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EXECUTIVE SUMMARY

Over the next five years the existing mines of OneSteel in the Middleback Ranges and Iluka on the far west coast of South Australia are likely to be joined by at least seven new mining operations, with a number of others in prospect subject to ongoing exploration and feasibility studies.

While this expansion will be dominated by iron ore mines, reflecting the rich prospectivity of the Eyre Peninsula region, at least one uranium and one kaolin mine are likely to be established, with potential for further iron ore, mineral sands, uranium, gold, manganese and nickel mines to emerge.

The scale of construction activities for these mining operations and for the supporting infrastructure, such as ports, roads, pipelines and power distribution will be unprecedented since the development of the iron ore and steel-making operations at Whyalla.

These projects will transform the economic and social structure of the Eyre Peninsula. They will offer exciting and rewarding employment opportunities for the local community and attractive new business opportunities for existing and new businesses in the region.

The Training and Skills Commission believes it is critical that high quality workforce planning is undertaken to ensure that the region maximises and captures the economic and social dividends on offer. The purpose of this study is therefore to inform and influence the appropriate allocation of training places and resources for this to occur.

All mining project proponents recognise how critical the availability of a suitably skilled and qualified workforce will be to the success of their projects and welcomed this initiative to identify and integrate their workforce requirements. Without exception, every person approached responded positively to requests for information and data and this attitude was greatly appreciated.

If all seven mines included in this study proceed to the operating phase, it is estimated that more than 2200 ongoing direct jobs will be created in mining and processing operations over the next decade, with many positions continuing for decades to come. Conservative estimates of new jobs associated with construction of mines and infrastructure indicate there will be a requirement for at least a further 4500 jobs over the next five years, peaking at 1700 positions in 2014.

It is also important to note that there is a relatively high level of staff turnover within these operations and the new job openings resulting will substantially exceed the number of new jobs created. Turnover is anticipated to range from 15% to 30% per annum, although the less skilled occupations experience notably lower turnover. If all mines proceed, it is estimated that replacement demand over the next decade will exceed 5000 positions.

At this point a note of caution is warranted. Notwithstanding the substantial commitments and investments being made by the proponent companies, there is no certainty that every one of these projects will proceed to operation. Risks include technical issues, access to infrastructure, access to finance, government approvals, company priorities and approvals

and international market conditions. For certain applications it is considered prudent to discount workforce forecasts to reflect the probability of each project proceeding.

Accordingly probability weightings based on project status have been applied to workforce forecasts, according to a weighting scheme developed by the engineering firm Parsons Brinkerhoff (PB) in consultation with PIRSA. Estimates have been provided with and without weightings. When probability weightings are assigned, the estimate for new job creation falls to around 700, compared to 2200 without weightings. Estimates for replacement demand also fall dramatically.

From the workforce forecasts provided, the following occupations will experience the greatest job openings:

- Accountant
- Surveyor
- Electrical Engineer
- Mechanical Engineer
- Production or Plant Engineer
- Mining Engineer
- Environmental Scientist
- Geologist
- Metallurgist
- Occupational Health and Safety Professional
- Laboratory Technician
- Electrical Technician
- Mechanical Technician
- Metallurgical Technician
- Motor Mechanic - Diesel
- Welder
- Metal Fabricator/Boilermaker
- Fitter
- Electrician
- Driller
- Miner
- Stationary Plant Operator
- Mobile Plant Operator
- Truck Driver
- Mining Support Worker

Qualifications for which there will be the greatest demand are:

- Bachelor of Engineering (Mechanical)
- Bachelor of Engineering (Mining)
- Bachelor of Science (Mineral Geoscience)
- Certificate III in Engineering (Fabrication Trade)
- Certificate III in Engineering (Mechanical Trade)
- Certificate III in Electrotechnology Electrician
- Certificate III in Mining Exploration
- Certificate II to IV in Resource Processing
- Certificate II to IV in Surface Extraction Operations
- Dual Certificate II Program in Resources IWP and Surface Extraction

While estimates of the proportion of positions available to applicants without experience were varied and indications ranged from nil (for technical roles in new mines) to 100% for plant operators, a pragmatic estimate would be 10% to 20% of positions being available to new entrants (i.e. without experience) for most positions that require formal qualifications.

All companies advised that they had strong commitments to education, training and employment opportunities for the Aboriginal community, regardless of whether formal agreements will be required or not. Iluka and Iron Clad have formal Native Title Agreements in place, prescribing a range of obligations and initiatives.

Other companies are yet to enter into detailed negotiations but nevertheless expressed their desire to work with government and the community to ensure that Aboriginal people are able to take advantage of the employment opportunities that will emerge. This provides an opportunity for the SA Government and Regional Development Australia Whyalla and Eyre Peninsula (RDA WEP) to work with these companies to support and assist them in developing appropriate policies and programs.

All companies expressed a strong desire to recruit people from the local region, although the need to bring staff in from outside the region was recognised as a reality.

In the course of the study it was noted that the National Resources Employment Taskforce¹ has recommended that resources companies be required to provide a workforce impact statement to outline the workforce needs of their projects at the same time as they apply to the relevant state or territory government for approval.

Given the importance of robust workforce planning, consideration should be given to implementing this suggestion in South Australia. This could be done by including a requirement for a workforce plan within the Mining Lease Proposal which follows project scoping and feasibility studies in the project development process. While this might be perceived as introducing additional red tape to the approvals process, the benefits of the approach to both the industry and community may well be considered to offset the costs. It is strongly recommended that further consultation be undertaken with industry to explore this suggestion.

1

<http://www.deewr.gov.au/Skills/Programs/National/ResourcesWorkforce/Documents/AGWorkforceStrategy.pdf>

1 INTRODUCTION

In response to substantial international demand for a wide range of minerals and resulting high commodity prices, and encouraged by the South Australian Government's PACE program and a supportive regulatory environment, the past seven years have seen record investment in minerals exploration in South Australia, with the Gawler Craton and the Eucla Basin figuring prominently.

This exploration activity has now led to numerous projects underway or in development in this area. To quote from the Regional Profile for Whyalla and Eyre Peninsula (WEP)² prepared by the Regional Development Australia (RDA) Whyalla and Eyre Peninsula, the region "is rapidly becoming one of Australia's most promising emerging minerals frontiers".

These projects will transform the economic and social structure of the Eyre Peninsula. They will offer exciting and rewarding employment opportunities for the local community and attractive new business opportunities for existing and new businesses in the region

The availability of a skilled and qualified workforce to meet the requirements of the resources sector in a timely manner is critical from two perspectives:

- *Economic dividend* – ensuring that resources projects proceed in a timely and cost-effective manner and are not impeded by a shortage of skilled and qualified workers or excessive wages costs driven by such a shortage; this will maximise the economic benefits that will flow to South Australia including the regions in which these projects are located.
- *Social dividend* – ensuring maximum participation by the local workforce to ensure that the social benefits that flow to local communities are maximised.

It is now critical that the projected workforce requirements of these projects are identified. High quality workforce planning will inform and influence the nature of courses offered by the training and education system and will enable the appropriate allocation of training places and resources to meet these priorities.

It will also underpin the development and delivery of programs designed to increase workforce participation and provide opportunities for members of local communities to participate in the employment opportunities associated with these projects.

Finally it will provide the necessary information and incentives to encourage individual members of the community to take steps to ensure they have the skills and qualifications to gain employment in the sector.

As identified in the Resources Industry Workforce Action Plan, RESA is committed to becoming a one-stop-shop and a key point of reference for information on the resources industry's workforce and skilling requirements. We believe it is important to integrate workforce planning with systemic and program responses and other strategic initiatives to ensure these requirements are met. Accordingly we believe there are strong synergies

²

<http://www.eyreregion.com.au/images/stories/PDFs/RDA%20WEP%20Regional%20Profile%202010%20Final.pdf>

between this study and RESA's other activities and we are keen to leverage these synergies. We envisage that this project will be an important foundation stone in developing a more in-depth understanding of the sector's workforce over the coming year.

2 OBJECTIVES AND SCOPE

The overarching goals of this study relate to both the economic and social dividends discussed in the Introduction.

Both the RDA and the Training and Skills Commission are keen to ensure that members of the local community (i.e. Eyre Peninsula and the Far West Coast) have every opportunity to participate in these emerging projects. Recognising that some jobs will be filled from outside the region it is also important to ensure that these opportunities are also available to South Australians more broadly.

A structured and comprehensive approach to ensuring that the workforce is ready for these projects will also enable projects to proceed in a timely and cost-effective manner. Accordingly this study was commissioned to identify:

“the workforce requirements of the various resources projects in the area, including projected demand for labour and training.”

The scope of work calls for:

- Estimated direct employment of mining projects in the Eyre Peninsula
- Estimated demand for labour by occupational classification each year
- Estimated demand for selected skilled trades and occupations
- Estimated total demand for VET qualifications (training requirement) for each year
- The estimated training requirements classified by the occupational classifications

It was understood that this was to be a ‘real world’ study, engaging directly with project proponents to understand status and their requirements – not a theoretical task incorporating economic and/or workforce modelling.

3 METHODOLOGY

3.1 Data gathering

It was initially proposed that the study would rely heavily on a survey/questionnaire that would be emailed to project proponents for initial data gathering and complemented by selected follow-up interviews.

Given the emerging status of many of the projects, face to face interviews were conducted initially with as many project proponents as feasible and phone/email interviews were conducted where necessary. In many cases ‘survey’ templates were provided to proponents following the initial interview, however proponents were given the option of providing data in their own internal format.

A list of target projects was identified by the RDA. This was complemented by information from PIRSA and company web-sites including announcements to the ASX regarding scope and status of projects.

The definition of mining and the concept of direct employment were clarified at the commencement of the study. Increasingly both exploration and mining proponents act largely as project and contract managers, outsourcing substantial components of the task to contractors and also engaging labour hire companies etc.

These factors complicate the task of identifying the “direct employment’ associated with mining activities and also training requirements. Where feasible, every effort has been made to incorporate projected workforce requirements of major contractors who are engaged directly on these projects.

It was also considered important to identify the proportion of new job openings that are available to the local community, and to distinguish those job openings that will be suitable for newly qualified workers or those with limited industry experience from those that will require substantial and/or specialist experience or qualifications.

Information was also sought on:

- The proportion of new job openings that are available to the local community
- The proportion of new job openings that are available to new entrants
- Occupations that are difficult to fill
- Key contractors used
- Training requirements, including up-skilling and cross-skilling
- Approach to employing:
 - Aboriginal workers
 - Disadvantaged
 - Women
 - Apprentices and Trainees
- Approach to fostering aboriginal economic development
- Use of skilled migration
- Improvement suggestions related to skills, training and/or workforce programs

3.2 Probability Weightings and Staff Turnover

Notwithstanding the substantial commitments and investments being made by the proponent companies, there is no certainty that every one of these projects will proceed to operation. Risks include technical issues, access to infrastructure, access to finance, government approvals, company priorities and approvals and international market conditions. For certain applications of the findings of this study, it is considered prudent to discount workforce forecasts by a factor based on probability of each project proceeding.

Accordingly probability weightings based on project status have been applied according to a weighting scheme developed by the engineering firm PB in consultation with PIRSA. Anticipated workforce turnover has also been factored into forecasts for job openings.

Companies were asked to advise typical or anticipated staff turnover for each job category. In some cases this was provided, while in a number of cases an overall estimate was provided for the total workforce. Where estimates were provided at occupation level they were incorporated into the estimates.

Estimates have been derived with and without probability weightings and with and without staff turnover. Selection of which estimate is most appropriate will be best done by the user, dependent on the application for which the data is being used.

3.3 Occupation and Qualification Listings

The Training and Skills Commission publishes a specialist occupations list as part of its annual *Skills for Jobs* publication. For the purposes of this study specialist occupations relating to the building and construction, electrotechnology and mining industries were extracted from the Commission's list, together with qualifications related to these occupations.

Using this list as a starting point, a customised list of occupations was derived for the project, also utilising ANZCO Occupations, and a list provided by the South Australian office of SkillsDMC³.

Once the occupation list was finalised, indicative qualifications were developed for relevant occupations, drawing on the WPP list, a list of "typical" qualification provided in a *Western Australian Mining Industry Workforce Development Plan*⁴ developed by the WA Resources Industry Training Council, TAFE SA courses and the DEEWR Jobs Guide⁵.

Finally forecast demand for qualifications was derived for occupations considered most in demand, categorised by occupation and also by qualification.

The timeframe for the study has necessitated that this list is largely the result of a desk-top exercise, with limited consultation with industry. As part of its core business, RESA will undertake further consultation with industry and SkillsDMC to confirm the most appropriate qualifications for each occupation.

In some instances e.g. Stationary Plant Operators, Mobile Plant Operators and Mine Support Workers, appropriate courses have been identified, however on a number of occasions companies have advised that their focus is on skills sets and competencies rather than formal qualifications. This issue requires further consultation and consideration.

³ <http://www.skillsdmc.com.au/>

⁴ *Western Australian MINING Industry: WORKFORCE DEVELOPMENT PLAN*, November 2010, WA Resources Industry Training Council; available for download from <http://ritcwa.com.au/>

⁵ <http://www.jobguide.thegoodguides.com.au/>

4 PROJECT STATUS

The following projects were researched to establish their status and significance for the study:

Project	Proponent	Deposit(s)	Status/comments
Project Magnet and OneSteel Processing Plant	OneSteel	Hematite Magnetite	<ul style="list-style-type: none"> ▪ Ongoing operational mining in South Middleback Ranges (Iron Duke, Iron Duchess, Iron Magnet and Iron Knight) ▪ Ongoing expansion at Iron Chieftain, resumption of activities at Iron Knob and Iron Baron ▪ New Ore Beneficiation plant planned at Iron Baron
Jacinth/Ambrosia	Iluka	Mineral Sands:	Fully operational zircon mining and concentration plant
Tripitaka	Iluka	Mineral Sands:	Initial prefeasibility study (PFS) undertaken; project on hold; additional PDS work required before further statements can be made (not included in workforce forecasts)
Wilgerup	Centrex	Hematite	<ul style="list-style-type: none"> ▪ All approvals in place ▪ Deferred pending development of Sheep Hill Port ▪ Anticipated production commencing in 2014
Bungalow	Centrex JV with Baogang Iron and Steel Group	Magnetite	<ul style="list-style-type: none"> ▪ PFS underway ▪ Anticipate production commencing in 2015
Carrow Koppio Bald Hill Iron Mount Greenpatch Mount Hill	Eyre Iron (JV between Centrex & Wuhan Iron & Steel Group Co),		<ul style="list-style-type: none"> ▪ PFS underway ▪ Anticipate production commencing in 2015
Wilchery Hill	IronClad	Magnetite	<ul style="list-style-type: none"> ▪ Definitive Feasibility Study (DFS) completed ▪ Mining Lease Proposal Submitted ▪ Anticipate production commencing in 2011
Warrambo	Iron Road	Magnetite	<ul style="list-style-type: none"> ▪ PFS completed; DFS underway ▪ Anticipate production commencing in 2015
Poochera	Minotaur	Kaolin	<ul style="list-style-type: none"> ▪ Ongoing resource definition drilling through 2011 ▪ PFS and DFS to be completed in 2011 ▪ Anticipate production commencing in 2013
Tunkillia	Minotaur/Helix	Gold	Ongoing exploration and scoping study (not included in workforce forecasts)
Mullaquana	Uranium SA	Uranium	<ul style="list-style-type: none"> ▪ Field Trial planned for 1Q 2012 ▪ Anticipate production commencing in 2013
Gum Flat	Lincoln Minerals	Iron Ore	<ul style="list-style-type: none"> ▪ Scoping Study completed ▪ Mining lease application for Stage 1 nearing completion for production in 2012 ▪ PFS for Stage 2 complete; DFS underway
Eucla Basin	Diatreme Resources		Early stage exploration targeting zircon (not included in workforce forecasts)
	Adelaide Resources		No notable activity on Eyre Peninsula (not included in workforce forecasts)
Waddikee	Monax Mining	Manganese and Iron	Ongoing exploration to enhance resource definition (not included in workforce forecasts)
Bramfield	Lymex Ltd	Iron Ore	Early stage exploration (not included in workforce forecasts)
Kalgaroo	Uranium One	Uranium	Early stage exploration (not included in workforce forecasts)

Fowlers Bay	Gunson Resources	Nickel	Early stage exploration (not included in workforce forecasts)
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5 PROJECTS INCLUDED IN THE STUDY

In summary then the following projects have been included in workforce forecasts:

- OneSteel – Project Magnet and OneSteel Processing Plant
- Iluka – Jacinth /Ambrosia
- Iron Clad – Wilchery Hill Stage 1
- Iron Road – Warrambo
- Centrex – Bungalow
- Centrex – Lower Eyre projects (Eyre Iron Joint Venture)
- Lincoln Minerals – Gum Flat Stage 1
- Lincoln Minerals – Gum Flat Stage 2
- Uranium SA – Mullaquarna
- Minotaur – Poochera

While the status of Centrex’s Wilgerup mine is such that it would desirably be included, the company advised that workforce requirements will be minimal compared to Bungalow and Eyre Iron projects and hence no data was provided.

Given the limited time and scope of the study, the myriad of exploration activities on the Eyre Peninsula have not been included and a number of projects nominated initially or identified through this process have been excluded as they are still in the exploration phase.

Efforts were also made to explore workforce requirements for the Arafura Resources Whyalla Rare Earth Processing Plant and the DEEPAK Ammonia Nitrate Processing Complex, however no data was available as Feasibility Studies and Environmental Impact Statements are still underway.

Following discussions with the Office of the Training and Skills Commission and RDA WEP efforts were made to include key infrastructure projects, however with one exception (the Centrex Port at Sheep Hill), data provided has generally been limited to high level employment totals for a small number of projects.

6 PROJECT PROBABILITY WEIGHTINGS

Probability weightings have been assigned using the following system developed recently by consulting group PB and endorsed by RESIC:

Stage	Weighting
Exploration (no JORC)	5%
Exploration (JORC)	10%
Scoping Study/Resource Definition complete	20%
Pre-Feasibility Study complete	30%
Feasibility Study complete	40%
Bankable Feasibility Study complete	50%
Project Approved by Company	80%
Full Approvals and Funding in place – project execution	100%

Weightings have been assigned to each project as follows:

PROJECT	STAGE	WEIGHTING
OneSteel – Project Magnet	Execution	100%
Iluka	Execution	100%
Iron Clad – Stage 1	Awaiting approval of Mining Lease Proposal – to be followed by MARP	80%
Iron Clad – Stage 3	PFS underway	20%
Iron Clad – Stage 3	PFS underway	20%
Iron Road	PFS complete	30%
Centrex - Bungalow	PFS underway	20%
Centrex – Eyre Iron	PFS underway	20%
Lincoln Minerals – Gum Flat Stage 1	Awaiting approval of Mining Lease Proposal – to be followed by MARP	80%
Lincoln Minerals – Gum Flat Stage 2	PFS complete	30%
Minotaur – Poochera Kaolin	PFS complete	30%
Uranium SA	PFS complete	30%

7 WORKFORCE FORECASTS

7.1 Overview

Using data derived from survey returns and interviews, estimates of workforce profiles for the period 2011 to 2020 have been undertaken for each of the projects included in the study, as discussed in Section 5.

Workforce forecasts for key contractors for OneSteel (HWE) and Iluka (Exact Mining, Kalari Transport and Australian Camp Services) have been included in the aggregated forecasts. For mines yet to commence operation, efforts have been made by the proponents to include the contractor workforce for key elements of ongoing operations such as mining, transport etc. Of course there are also numerous smaller contractors and product and service providers for whom workforce data is not included. A list of these contractors is included in Section 12.

Employment forecasts are generally confined to on-site activities; accordingly corporate/head office workforce is not included.

Neither Iluka nor OneSteel provided data spanning this full period so data provided by these companies has been extrapolated to 2020 to avoid an unintended and misleading impression of job reductions in the out-years.

Forecast estimates for total employment and also job openings have been derived, with and without probability weightings and the turnover of staff. Summary tables are provided in Section 7.2 as follows:

- Total Employment without no probability weightings (i.e. simple aggregates)
- Total Employment with probability weightings
- Job Openings with probability weightings but without workforce turnover – the probability weighted estimates of new jobs created
- Job Openings including estimates of workforce turnover with probability weightings

Detailed estimates by occupation are provided in the Appendices for each of these scenarios.

7.2 Estimates of Total Employment

7.2.1 Total Employment with no Probability Weighting

If workforce forecasts for all mines are aggregated with no weighting (i.e. it is assumed that each mine will proceed according to the timing advised) total employment will grow from 2827 in 2011 to 4898 in 2011 – a total increase of 2224, allowing for forecast growth of 153 jobs through 2011.

A summary breakdown of these forecasts based on ANZSCO groups is provided in Table 1 below. A detailed breakdown of these estimates by occupation is provided in Appendix 1.

Table 1: Total Employment with no Probability Weighting

ANZSCO GROUP	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Specialist Managers	99	124	138	149	153	143	135	134	134	134
Business, Human Resource and Marketing Professionals	48	50	64	71	78	78	78	78	78	78
Surveyors, Engineering and ICT Professionals	151	178	208	240	257	257	257	257	257	257
Natural and Physical Science Professionals	33	58	70	80	85	85	85	84	84	84
Occupational and Environmental Health Professionals	17	19	30	32	35	35	35	32	32	32
Engineering, ICT and Science Technicians	150	157	181	220	269	269	269	268	268	268
Trades Workers	556	578	591	723	896	896	896	896	896	896
Hospitality Workers, Cleaners and Laundry Workers	19	23	27	53	79	79	79	79	79	79
Clerical and Administrative Workers and Storepersons	135	142	170	190	198	198	198	196	196	196
Stationary Plant Operators	1205	1219	1240	1295	1452	1480	1480	1472	1472	1472
Mobile Plant Operator	100	132	199	269	476	476	476	475	475	475
Road and Rail Drivers	57	267	492	502	508	508	508	498	498	498
Construction and Mining Labourers	113	118	120	161	196	196	196	196	196	196
Apprentices	79	90	93	93	103	127	127	127	127	127
Trainees	66	66	66	66	66	86	106	106	106	106
TOTAL	2827	3220	3688	4143	4850	4912	4924	4898	4898	4898

7.2.2 Total Employment with Probability Weighting

When weightings are applied to forecasts to reflect the probability that each mine will proceed as discussed in Section 3.2 and Section 6, the estimates of employment growth reduce substantially.

As shown in the Table 2 below, total employment is forecast to grow from 2769 in 2011 to 3338 in 2020 – a total increase of 691, allowing for forecast growth of 122 jobs through 2011. A detailed breakdown of these estimates by occupation is provided in Appendix 2.

Table 2: Total Employment with Probability Weighting

ANZSCO GROUP	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Specialist Managers	97	102	106	109	107	105	104	102	102	102
Business, Human Resource and Marketing Professionals	48	48	52	54	56	56	56	56	56	56
Surveyors, Engineering and ICT Professionals	150	170	174	182	187	187	187	187	187	187
Natural and Physical Science Professionals	32	46	45	47	49	49	49	48	48	48
Occupational and Environmental Health Professionals	17	18	23	24	24	24	24	22	22	22
Engineering, ICT and Science Technicians	149	156	163	172	184	184	184	183	183	183
Trades Workers	550	572	576	606	649	649	649	649	649	649
Hospitality Workers, Cleaners and Laundry Workers	19	20	21	28	36	36	36	36	36	36
Clerical and Administrative Workers and Storepersons	135	141	148	154	156	156	156	154	154	154
Stationary Plant Operators	1196	1210	1221	1235	1277	1282	1282	1276	1276	1276
Mobile Plant Operator	73	80	95	116	178	178	178	177	177	177
Road and Rail Drivers	48	90	141	144	146	146	146	138	138	138
Construction and Mining Labourers	110	115	115	127	137	137	137	137	137	137
Apprentices	79	90	91	91	93	98	98	98	98	98
Trainees	66	66	66	66	66	70	74	74	74	74
TOTAL	2769	2923	3035	3153	3345	3357	3360	3338	3338	3338

7.2.3 Job Openings with Probability Weighting but not including Staff Turnover

When probability weightings are applied, estimates of new jobs created are reduced substantially as shown in Table 5. In this case it is estimated that 691 new jobs will be created, compared to an estimate of 2224 if no probability weighting is applied.

A detailed breakdown of these estimates by occupation is provided in Appendix 3.

Table 3: Job Openings with Probability Weighting but not including Staff Turnover

ANZSCO GROUP	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	TOTAL
Specialist Managers	0	5	4	2	-1	-2	-2	-2	0	0	5
Business, Human Resource and Marketing Professionals	0	0	4	2	2	0	0	0	0	0	8
Surveyors, Engineering and ICT Professionals	6	20	4	8	5	0	0	0	0	0	43
Natural and Physical Science Professionals	0	14	-1	3	2	0	0	-1	0	0	16
Occupational and Environmental Health Professionals	0	1	5	0	1	0	0	-2	0	0	5
Engineering, ICT and Science Technicians	0	6	8	9	12	0	0	-1	0	0	34
Trades Workers	17	22	3	30	44	0	0	0	0	0	116
Hospitality Workers, Cleaners and Laundry Workers	0	1	1	8	8	0	0	0	0	0	17
Clerical and Administrative Workers and Storepersons	0	6	8	5	2	0	0	-2	0	0	19
Stationary Plant Operators	27	14	11	14	42	6	0	-7	0	0	107
Mobile Plant Operator	30	6	15	21	62	0	0	-1	0	0	134
Road and Rail Drivers	38	42	51	3	2	0	0	-8	0	0	128
Construction and Mining Labourers	5	5	-1	12	11	0	0	0	0	0	32
Apprentices	0	11	1	0	2	5	0	0	0	0	19
Trainees	0	0	0	0	0	4	4	0	0	0	8
TOTAL	122	154	112	118	192	12	2	-22	0	0	691

7.2.4 Job Openings with Probability Weighting and including Staff Turnover

Table 6 shows the increase in estimates of job weightings when an estimate of staff turnover is applied. It is estimated that an additional 3296 job openings will be created due to staff turnover – again many times the number of new jobs created. A detailed breakdown of these estimates by occupation is provided in Appendix 4.

Table 4: Job Openings with Probability Weighting and including Staff Turnover

ANZSCO GROUP	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	TOTAL
Specialist Managers	0	17	18	17	16	13	13	13	14	14	137
Business, Human Resource and Marketing Professionals	0	8	11	10	10	9	9	9	9	9	82
Surveyors, Engineering and ICT Professionals	6	42	30	35	34	30	30	30	30	30	294
Natural and Physical Science Professionals	0	22	11	14	13	12	12	11	12	12	119
Occupational and Environmental Health Professionals	0	4	7	4	4	4	4	1	3	3	34
Engineering, ICT and Science Technicians	0	27	29	32	36	27	27	26	27	27	258
Trades Workers	17	79	62	90	108	73	73	73	73	73	722
Hospitality Workers, Cleaners and Laundry Workers	0	4	4	12	13	8	8	8	8	8	72
Clerical and Administrative Workers and Storepersons	0	19	22	21	19	17	17	15	17	17	163
Stationary Plant Operators	27	109	107	112	142	113	108	102	107	107	1036
Mobile Plant Operator	30	22	32	40	86	39	39	38	39	39	404
Road and Rail Drivers	38	49	64	24	24	22	22	15	21	21	298
Construction and Mining Labourers	5	19	14	27	29	21	21	21	21	21	197
Apprentices	0	18	9	8	10	13	9	9	9	9	93
Trainees	0	7	7	7	7	11	12	9	9	9	79
TOTAL	122	446	427	453	552	411	403	379	397	397	3987

8 WORKFORCE FORECASTS FOR CONSTRUCTION PROJECTS

It has generally not been feasible to obtain data related to workforce forecasts broken down by occupation for construction phases of mines or infrastructure projects. This level of detailed data was provided only by Centrex in relation to their proposed Sheep Hill port. Man-hour data in three categories was provided for the Port Bonython port while total employment forecasts for construction activities were provided for two mines. Total employment forecasts relating to the BHP Desalination Plant at Point Lowly have been taken from the EIS for the Olympic Dam Expansion. Conservative total workforce estimates for construction activities for other mines have been made using the data that was provided as a guide.

This data was integrated to derive the following estimates of total new jobs associated with construction:

2011	2012	2013	2014	2015	2016
100	600	1400	1700	500	200

Occupations required will include labourers, carpenters, marine workforce, boilermakers, concrete workers, crane operators, electricians, metalworkers, boilermakers and mechanics.

9 OCCUPATIONS MOST IN DEMAND

From the workforce forecasts provided the following occupations will experience the greatest job openings:

- Accountant
- Surveyor
- Electrical Engineer
- Mechanical Engineer
- Production or Plant Engineer
- Mining Engineer
- Environmental Scientist
- Geologist
- Metallurgist
- Occupational Health and Safety Professional
- Laboratory Technician
- Electrical Technician
- Mechanical Technician
- Metallurgical Technician
- Motor Mechanic - Diesel
- Welder
- Metal Fabricator/Boilermaker
- Fitter
- Electrician
- Driller
- Miner
- Stationary Plant Operator
- Mobile Plant Operator
- Truck Driver
- Mining Support Worker

10 TRAINING REQUIREMENTS

The Training and Skills Commission publishes a specialist occupations list as part of its annual *Skills for Jobs* publication. For the purposes of this study specialist occupations relating to the building and construction, electrotechnology and mining industries were extracted from the Commission's list, together with qualifications related to these occupations. Using this list and workforce forecasts to identify those occupations most in demand, indicative qualifications were developed for 34 occupations. This process also drew on the DEEWR Jobs Guide, information regarding TAFE SA courses and a list of "typical" qualifications provided in a Western Australian Mining Industry Workforce Development Plan developed by the WA Resources Industry Training Council.

The timeframe for the study has necessitated that this list is largely the result of a desk-top exercise, with limited consultation with industry. As part of its core business, RESA will undertake further consultation with industry and SkillsDMC to confirm the most appropriate qualifications for each occupation. In some instances e.g. Stationary Plant Operators, Mobile Plant Operators and Mine Support Workers appropriate course have been identified, however on a number of occasions companies have advised that their focus is on skills sets and competencies rather than formal qualifications. This issue requires further consultation.

Obviously many positions will require experience and hence will not be open to new graduates or new entrants. Companies were asked to indicate the proportion of positions available to applicants without experience. While responses to this question were varied and indications ranged from nil (for technical roles in new mines) to 100% for plant operators, a pragmatic estimate would be 10% to 20% of positions being available to new entrants (i.e. without experience) for most positions that require formal qualifications.

This is lower than the anticipated job openings so it would be inappropriate to consider that the total demand for qualifications will translate directly to training requirements specifically related to these projects. However when experienced staff are recruited for new projects, vacancies will arise elsewhere in the workforce (leaving aside interstate and international migration for one moment). Therefore all additional demand can be expected to result in additional training requirements, discounted by the level of recruitment from interstate and/or overseas.

Without exception, every company indicated their preference to recruit locally and to consider international migration as a last resort for positions that cannot be filled locally. Hence the proportion of workforce recruited locally can be expected to grow over time, providing further opportunities for locally trained employees and the impact of interstate and international migration will be reduced accordingly.

Detailed estimates of demand for qualifications have been included in Appendices 5 and 6 as follows:

Appendix 5	Demand by Qualification with weighting and including staff turnover.
Appendix 6	Demand for Qualification by Occupation with weighting and including staff turnover.

Qualifications for which there will be the greatest demand are:

- Bachelor of Engineering (Mechanical)
- Bachelor of Engineering (Mining)
- Bachelor of Science (Mineral Geoscience)
- Certificate III in Engineering (Fabrication Trade)
- Certificate III in Engineering (Mechanical Trade)
- Certificate III in Electrotechnology Electrician
- Certificate III in Mining Exploration
- Certificate II to IV in Resource Processing
- Certificate II to IV in Surface Extraction Operations
- Dual Certificate II Program in Resources IWP and Surface Extraction

11 OCCUPATIONS THAT ARE DIFFICULT TO FILL

From the interviews and surveys the occupations identified as most difficult to fill currently are:

During Exploration and Operations

- Geologists
- Project Managers
- Mining Engineers
- Mineral Process Engineers/Metallurgists
- Skilled Process and Mining Operators
- Mobile Plant Operators
- Mechanical Technicians
- Electrical Technicians
- Maintenance Team Leaders
- Fixed and Mobile Plant Fitters
- Electricians
- Instrument Technicians

During Construction

- Concreters
- Structural steel construction workers
- Mechanical engineering trades workers (heavy plant installation)
- Electrical trades workers (electrical installation)
- Telecommunications technicians and tradesworkers

12 KEY CONTRACTORS

As discussed earlier the nature of mining operations is such that contractors and service providers play a critical role. Workforce forecasts for the following companies have been included in the aggregated estimates in Tables 1 to 6 and Appendices 1 to 6.

- HWE
- Exact Mining
- Kalari Transport
- Australian Camp Services

Other contractors identified during the study included:

- Walcha Contractors
- Lucas Earthmovers
- Brambles
- AAM Hatch Surveyors
- Worley Parsons - engineering functions
- Mining One
- Mining Plus
- Coffey Mining
- Worley Parsons
- Coffey Enviro
- Top Drive Drilling
- Coughlan Drilling
- ALS Chemex (Aust Lab Services)
- Geoscience Associates Australia
- Golder Associates
- Parsons Brinckerhoff
- METS
- Coffey Mining
- Evans & Peck
- Powranna Consulting
- GHD
- SKM
- EBS ecology
- Community Engagement Group Australia
- Ferrum Consulting
- Aldam Geoscience
- PRK Consulting WA
- A Strong Planner

13 EMPLOYMENT OPPORTUNITIES FOR THE ABORIGINAL COMMUNITY

All companies advised that they had strong commitments to education, training and employment opportunities for the Aboriginal community, regardless of whether formal agreements will be required or not. Iluka and Iron Clad have formal Native Title Agreements in place, prescribing a range of obligations and initiatives.

Other companies are yet to enter into detailed negotiations but nevertheless expressed their desire to work with government and the community to ensure that Aboriginal people are able to take advantage of the employment opportunities that will emerge. This provides an opportunity for the SA Government and RDA WEP to work with these companies to support and assist them in developing appropriate policies and programs.

Iluka provided a comprehensive overview of their strategies, programs and plans to support their target of 20% Indigenous employment. They require all contractors to participate in and

support activities to maximise Indigenous employment and work closely with the Far West Coast Traditional Lands Association Inc. to match potential employees with available jobs.

OneSteel Whyalla supports WALGA Contractors in conjunction with HWE, the mining contractor. Currently there are 30 WALGA employees at the mines. OneSteel Whyalla also supports the Whyalina agreement with local indigenous people. OneSteel's Diversity policy underpins their recruitment processes.

Centrex also has a formal Diversity Policy in place and supports direct employment of Indigenous people through HETA.

Far West Coast Traditional Lands Association Inc. is currently facilitating a Regional Labour Market Assessment on the Far West Coast, funded by DEEWR, with a view to enhancing the process for education, training and employment across the region. They are also in the process of recruiting an Employment Development Coordinator.

The South Australian Centre for Economic Studies is working with the Australian National University on a DEEWR funded study to produce estimates of current employment patterns and provide projections of future labour demand in three regions in the Port Augusta Eyre Peninsula, the Ceduna region; and the Anangu Pitjantjatjara Yankunytjatjara (APY) Lands. The project will include qualitative research to provide additional information about the skills required for existing vacancies with key employers and how best to provide appropriate training. Existing labour market programs which aim to increase employment rates amongst the Indigenous population will be identified and relevant implications of these programs will be discussed.

14 FURTHER INSIGHTS FROM THE INTERVIEWS AND SURVEYS

Employment Opportunities for the Local Community

All companies expressed a strong desire to recruit people from the local region, although the need to bring staff in from outside the region was recognised as a reality. One company advised that their plans assumed that at least half of their workforce would be recruited from the Eyre Peninsula with the remainder drawn from Adelaide and other centres on a fly-in fly-out basis. Another company pointed to the positive impact of OneSteel's Iron Duke mine on the Cowell region as an indication of the benefits that are likely to accrue.

Skilled Migration

Most companies considered leveraging skilled migration to be a tactic of last resort, confined to recruiting international migrants with substantial experience such as managers and occupations requiring specialist qualifications such as geologists, mining engineers and metallurgists.

Trends and Training Requirements

- An emerging trend is to utilise Process Technicians, who will both operate and maintain plant. They will be trade qualified and undertake training to develop the necessary process operations skills (Certificate 3 in Metalliferous Mining – soon to be renamed Certificate 3 in Resource Processing).

- One company spoke of a new initiative to meet ongoing ‘higher level’ trade related skills involving newly implemented trades Technician training to meet current and future needs. This program offers experienced trades people and graduating apprentices the opportunity to complete full diploma qualification and then move into technician level positions.
- It was noted on a number of occasions that companies prefer to focus on skill sets and competencies rather than formal qualifications. This issue requires further consultation and consideration.

Comments from Contractors

- Companies in South Australia are unable or unwilling to compete with salaries on offer in Western Australia in relation to diesel mechanics and exploration geologist.
- There is significant need for training to upskill riggers, drillers, crane drivers and the like to assist them to gain certification related to such areas as working in a confined space and working at heights.
- It was asserted by two different sources that there are many skilled workers in Whyalla who have failed drug and alcohol tests and are no longer acceptable to employers.
- One contractor suggested that 20% to 30% of new jobs are contracted out.
- Many contractors foreshadowed substantial growth over the next five years, with potential workforces growing to many times their current size.
- It was asserted that many workshops in the region are not compliant with safety standards required by mining companies.

15 ACKNOWLEDGEMENTS

RESA welcomes this initiative from the Training and Skills Commission and the Department of Further Education Employment Science and Technology and has appreciated the guidance and support provided by Patrick McAvaney from the Office of the Training and Skills Commission and Chris Zielinski from the Workforce Policy and Planning Directorate within DFEEST.

Andrea Broadfoot from DFEEST's South Australian Works Program and Mark Cant from the RDA (WEP) also provided valuable guidance and contacts with industry.

All mining project proponents recognised how critical the availability of a suitably skilled and qualified workforce will be to the success of their projects and welcomed this initiative to identify and integrate their workforce requirements. Without exception, every person approached responded positively to requests for information and data and this attitude was greatly appreciated.

In particular RESA would like to express appreciation to the following people who contributed data and insights to the study:

- Peter Hamence and Mike McCarron OneSteel
- Sally Fargher Iluka
- Jim White, Ben Hammond, Alastair Watt and Steve Brown Centrex
- Ken Houghton and Robert Fisher Iron Clad
- Larry Ingle Iron Road
- Tom Mayer and Barry Van Der Stelt Minotaur
- Alistair Muir and Damien Connor Uranium SA
- Jeff Messenger and Adele McGill HWE
- Georgina Harbeck Leighton Contractors
- John Parker Lincoln Minerals
- Nigel Smart and Brenton McClarty Rexco People
- Edward Milne Skilled Group
- Geoff Hood Downer EDI
- Dennis Hurn Brambles Industrial Services
- Andre Sliedrecht Workpac
- Karen Skinner WEP RDA
- Shivvaan Sathasilvam University of SA (Whyalla)
- Dave Grego SkillsDMC
- John Isgar Far West Coast Traditional Lands Association Inc

16 CONCLUSION AND RECOMMENDATIONS

This study was welcomed by all stakeholders contacted. There is tremendous goodwill within industry in relation to workforce planning and responses, although the emerging nature of many projects meant that there are limitations in the ability of mining companies to forecast their workforce requirements accurately. This particularly applies to multi-stage projects where future stages are subject to considerable uncertainty. The ability of companies to disclose timing and the quantum of capital investment was also confined to information that has already been released to the market.

Nevertheless this study provides a valuable foundation for ongoing workforce planning in the sector. Many companies applied considerable effort to developing their best picture of their future workforce and the resultant aggregates should be taken as a good indication of workforce requirements for planning purposes.

RESA has committed to undertake further consultation in relation to the most appropriate qualifications for the occupations forecast to be in greatest demand. We are also keen to engage in a dialogue with the Training and Skills Commission and DFEEST to explore extending the study to encompass all existing and emerging mining opportunities in South Australia.

The early stage nature of many of the projects studied provides an opportunity for the South Australian Government and RDA (WEP) to work with proponents to support and assist them in developing appropriate policies and programs to respond to their needs.

Two items that emerged from the interviews and surveys deserve further follow-up:

- Company preference to focus on skill sets and competencies rather than qualification
- The number of skilled and qualified workers who have failed drug and/or alcohol tests and hence are not eligible for employment with mining companies

In the course of the study it was noted that the National Resources Employment Taskforce⁶ has recommended that resources companies be required to provide a workforce impact statement to outline the workforce needs of their projects at the same time as they apply to the relevant state or territory government for approval.

Given the recognition of the importance of workforce by the industry, consideration should be given to implementing this suggestion in South Australian. This could be done by including a requirement for a workforce plan within the Mining Lease Proposal which follows project scoping and feasibility studies. While this might be perceived as introducing additional red tape to the approvals process, the benefits of the approach to both the industry and community may well be considered to offset the costs. It is strongly recommended that further consultation be undertaken with industry to explore this suggestion.

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<http://www.deewr.gov.au/Skills/Programs/National/ResourcesWorkforce/Documents/AGWorkforceStrategy.pdf>

Appendix 1: Total Employment with no Probability Weighting

ANZSCO GROUP	ANZSCO OCCUPATION	SURVEY TERMINOLOGY	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Specialist Managers	Exploration Manager	Exploration Manager	7	7	7	7	7	7	7	7	7	7
	Construction Manager	Construction Manager	3	23	23	24	24	14	6	6	6	6
	Engineering Manager	Engineering Manager	6	8	8	9	9	9	9	9	9	9
	Production Manager (Mining)	Mine Manager	7	7	10	12	13	13	13	12	12	12
	Production Manager (Mining)	Operations Manager	7	7	7	7	7	7	7	7	7	7
	Production Manager (Mining)	Production/Processing Manager	10	10	14	14	15	15	15	15	15	15
	Production Manager (Mining)	Materials/Ore Handling Manager	4	4	4	5	5	5	5	5	5	5
	Supply and Distribution Manager	Supply Manager	2	2	3	3	3	3	3	3	3	3
	Environmental Manager	Environmental Manager	3	3	5	5	5	5	5	5	5	5
	Laboratory Manager	Laboratory Manager	0	0	0	0	0	0	0	0	0	0
	Quality Manager	Quality Manager	5	5	5	5	5	5	5	5	5	5
	Facilities Manager	Site Manager	1	1	1	2	2	2	2	2	2	2
	Other Manager	Maintenance Manager	11	11	13	16	17	17	17	17	17	17
Other Manager	Health, Safety & Environment Manager	3	6	6	6	7	7	7	7	7	7	
Other Manager	Other Manager	30	30	32	34	34	34	34	34	34	34	
Business, Human Resource and Marketing Professionals	Accountant	Accountant	21	21	29	33	36	36	36	36	36	36
	Human Resource Professional	Human Resource Professional	13	13	15	15	15	15	15	15	15	15
	Training and Development Professional	Training and Development Professional	12	12	13	15	19	19	19	19	19	19

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	Public Relations Professional	Community Engagement Professional	2	4	7	8	8	8	8	8	8	8
Surveyors and Engineering Professionals	Surveyor	Surveyor	5	6	12	16	17	17	17	17	17	17
	Chemical Engineer	Chemical Engineer	2	2	3	3	3	3	3	3	3	3
	Materials Engineer	Metallurgical Engineer	5	5	5	9	10	10	10	10	10	10
	Civil Engineer	Civil Engineer	1	1	3	4	5	5	5	5	5	5
	Geotechnical Engineer	Tailings Manager	0	0	1	2	3	3	3	3	3	3
	Electrical Engineer	Electrical Engineer	17	24	25	28	30	30	30	30	30	30
	Electronics Engineer	Control Systems Engineer	5	5	5	5	5	5	5	5	5	5
	Industrial Engineers	Industrial Engineer	4	4	4	4	4	4	4	4	4	4
	Mechanical Engineer	Mechanical Engineer	45	51	54	59	63	63	63	63	63	63
	Production or Plant Engineer	Production or Plant Engineer	41	45	51	55	59	59	59	59	59	59
	Mining Engineer	Mining Engineer	14	23	29	39	41	41	41	41	41	41
	Environmental Engineer	Environmental Engineer	3	3	7	7	8	8	8	8	8	8
Natural and Physical Science Professionals	Chemist	Chemist	0	0	0	5	8	8	8	8	8	8
	Environmental Consultant	Environmental Consultant	3	3	3	3	3	3	3	3	3	3
	Environmental Scientist	Environmental Scientist	3	5	10	12	14	14	14	14	14	14
	Geologist	Geologist	20	40	40	41	41	41	41	40	40	40
	Geophysicist	Geophysicist	0	0	2	2	2	2	2	2	2	2
	Metallurgist	Metallurgist	7	10	15	17	17	17	17	17	17	17
Occupational and Environmental Health Professionals	Environmental Health Officer	Radiation Hygiene Specialist	0	0	2	2	4	4	4	4	4	4
	Occupational Health and Safety Professional	Occupational Health and Safety Professional	12	14	20	20	20	20	20	20	20	20

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ICT Professionals	ICT Business and Systems Analyst	ICT Business Analyst	9	9	9	9	9	9	9	9	9	9
Engineering, ICT and Science Technicians	Earth Science Technician	Environment & Rehabilitation Technician	1	1	1	1	1	1	1	1	1	1
	Earth Science Technician	Geological Technician	0	0	2	2	2	2	2	2	2	2
	Science Technician	Laboratory Technician	1	2	5	23	56	56	56	56	56	56
	Civil Engineering Draftsperson	Civil Engineering Draftsperson	0	0	2	2	2	2	2	2	2	2
	Electrical Engineering Technician	Electrical Technician	14	14	15	20	25	25	25	25	25	25
	Electronics Engineering Technician	Electronic Technician	1	1	1	1	1	1	1	1	1	1
	Mechanical Engineering Technician	Mechanical Technician	40	40	49	53	61	61	61	61	61	61
	Safety Inspector	Safety Officer	0	0	0	3	3	3	3	3	3	3
	Maintenance Planner	Maintenance Planner	43	49	49	53	53	53	53	53	53	53
	Metallurgical Technician	Metallurgical Technician	40	40	41	41	41	41	41	40	40	40
	Mine Deputy	Mine Deputy	4	4	5	5	5	5	5	5	5	5
	ICT Support Technician	ICT Technician	1	1	1	3	3	3	3	3	3	3
	Telecommunications Technician	Telecommunications Technician	0	0	0	2	5	5	5	5	5	5
Trades Workers	Instrumentation Technician	Instrumentation Technician	5	5	10	11	11	11	11	11	11	11
	Automotive Electrician	Automotive Electrician	20	20	20	20	20	20	20	20	20	20
	Motor Mechanic (General)	Motor Mechanic - General	4	4	5	5	5	5	5	5	5	5
	Diesel Motor Mechanic	Motor Mechanic - Diesel	175	175	175	231	315	315	315	315	315	315
	Sheetmetal Trades Worker	Sheetmetal Trades Worker	2	2	2	2	2	2	2	2	2	2
	Welder	Welder	11	11	17	25	34	34	34	34	34	34
	Metal Fabricator	Metal Fabricator/Boilermaker	44	46	46	46	46	46	46	46	46	46
	Metal Fitter	Fitter	183	195	197	229	268	268	268	268	268	268
	Metal Machinist	Metal Machinist	3	3	3	3	3	3	3	3	3	3
	Plumber	Plumber	0	0	3	5	7	7	7	7	7	7

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	Electrician	Electrician	93	101	102	134	169	169	169	169	169	169
	Airconditioning and Refrigeration Mechanic	Airconditioning and Refrigeration Mechanic	8	8	8	10	14	14	14	14	14	14
	Electronic Instrument Trades Worker	Instrumentation Fitter	14	14	14	14	14	14	14	14	14	14
Hospitality Workers	Other Hospitality Worker	Village Support Worker	9	9	9	33	57	57	57	57	57	57
Clerical and Administrative Workers	Contract, Program and Project Administrator	Administration Manager/Officer	16	19	23	23	25	25	25	25	25	25
	Office Manager	Office Manager	0	0	2	2	3	3	3	3	3	3
	Personal Assistant	Personal Assistant	0	0	2	4	4	4	4	4	4	4
	Secretary	Secretary	0	1	1	2	2	2	2	2	2	2
	General Clerk	General Clerk	47	49	57	65	67	67	67	65	65	65
	Receptionist	Receptionist	0	0	3	3	4	4	4	4	4	4
	Accounting Clerks and Bookkeeper	Accounting Clerks and Bookkeeper	1	1	3	5	5	5	5	5	5	5
	Purchasing Officer	Purchasing Officer	19	19	25	32	34	34	34	34	34	34
	Warehouse Administrator	Warehouse/Logistics Coordinator	30	30	30	30	30	30	30	30	30	30
Stationary Plant Operators	Crane, Hoist and Lift Operator	Crane, Hoist and Lift Operator	11	11	11	11	11	11	11	11	11	11
	Driller	Driller	33	33	33	57	93	93	93	93	93	93
	Miner	Miner	387	387	390	400	430	430	430	427	427	427
	Shot Firer	Shot Firer	14	14	15	16	16	16	16	15	15	15
	Chemical Production Machine Operators	Operations Team Leader	62	65	65	65	65	65	65	65	65	65
	Chemical Production Machine Operators	Production Worker	557	557	557	557	585	613	613	613	613	613
	Chemical Production Machine Operators	Plant Technician	0	0	9	9	9	9	9	9	9	9

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	Other Stationary Plant Operator	Stationary Plant Operator	139	150	159	178	236	236	236	231	231	231
	Bulk Materials Handling Plant Operator	Bulk Materials Handling Plant Operator	0	0	0	0	0	0	0	0	0	0
	Waste Water or Water Plant Operator	Waste Water or Water Plant Operator	2	2	2	3	8	8	8	8	8	8
Mobile Plant Operator	Earthmoving Plant Operator	Mobile Plant Operator	100	132	199	269	476	476	476	475	475	475
Road and Rail Drivers	Truck Driver	Truck Driver	57	267	492	502	508	508	508	498	498	498
Storepersons	Storeperson	Storeperson	22	23	24	24	24	24	24	24	24	24
Cleaners and Laundry workers	Cleaner	Cleaner	10	14	18	20	22	22	22	22	22	22
Construction and Mining Labourers	Mining Support Worker	Driller's Assistant	30	30	32	41	41	41	41	41	41	41
	Mining Support Worker	Mining Support Worker	28	32	32	64	99	99	99	99	99	99
	Mining Support Worker	Maintenance Team Leader	33	33	33	33	33	33	33	33	33	33
	Mining Support Worker	Maintenance Support Worker	22	23	23	23	23	23	23	23	23	23
		Other (First Aid, Emergency Worker, Security)	5	5	8	10	11	11	11	8	8	8
		Apprentice Electrician	31	31	32	32	32	42	42	42	42	42
		Apprentice Auto Electrician	0	4	4	4	4	4	4	4	4	4
		Apprentice Fabricator	6	6	6	6	6	6	6	6	6	6
		Apprentice Fitter: Instrumentation	8	8	8	8	8	8	8	8	8	8
		Apprentice Fitter: Light Vehicle	0	3	3	3	3	3	3	3	3	3
		Apprentice Fitter: Mechanical	28	28	29	29	29	39	39	39	39	39
		Apprentice Instrument / Electrical Technician	0	0	1	1	1	3	3	3	3	3
		Apprentice Mechanic: Heavy Diesel	2	6	6	6	16	16	16	16	16	16

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		Apprentice Welder	4	4	4	4	4	6	6	6	6	6
		Trainee (Cadet)	45	45	45	45	45	65	85	85	85	85
		Trainee (Office)	1	1	1	1	1	1	1	1	1	1
		Trainee (Operator)	16	16	16	16	16	16	16	16	16	16
		Trainee (OHS)	4	4	4	4	4	4	4	4	4	4
		TOTALS	2827	3220	3688	4143	4850	4912	4924	4898	4898	4898
		GROWTH	153	393	468	455	707	62	12	-27	0	0
		CUM GROWTH	153	546	1014	1469	2176	2238	2250	2224	2224	2224

Appendix 2: Total Employment with Probability Weighting

ANZSCO GROUP	ANZSCO OCCUPATION	SURVEY TERMINOLOGY	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Specialist Managers	Exploration Manager	Exploration Manager	7	7	6	6	3	3	3	3	3	3
	Construction Manager	Construction Manager	3	7	7	7	7	5	4	4	4	4
	Engineering Manager	Engineering Manager	6	6	6	7	7	7	7	7	7	7
	Production Manager (Mining)	Mine Manager	6	6	8	8	8	8	8	8	8	8
	Production Manager (Mining)	Operations Manager	6	6	6	6	6	6	6	6	6	6
	Production Manager (Mining)	Production/Processing Manager	9	9	10	10	11	11	11	11	11	11
	Production Manager (Mining)	Materials/Ore Handling Manager	4	4	4	4	4	4	4	4	4	4
	Supply and Distribution Manager	Supply Manager	2	2	2	2	2	2	2	2	2	2
	Environmental Manager	Environmental Manager	3	3	4	4	4	4	4	3	3	3
	Laboratory Manager	Laboratory Manager	0	0	0	0	0	0	0	0	0	0
	Quality Manager	Quality Manager	5	5	5	5	5	5	5	5	5	5
	Facilities Manager	Site Manager	1	1	1	1	1	1	1	1	1	1
	Other Manager	Maintenance Manager	11	11	12	12	13	13	13	13	13	13
	Other Manager	Health, Safety & Environment Manager	3	4	4	4	4	4	4	4	4	4
	Other Manager	Other Manager	30	30	31	31	31	31	31	31	31	31
Business, Human Resource and Marketing Professionals	Accountant	Accountant	21	21	23	24	25	25	25	25	25	25
	Human Resource Professional	Human Resource Professional	13	13	13	13	13	13	13	13	13	13
	Training and Development Professional	Training and Development Professional	12	12	12	13	14	14	14	14	14	14
	Public Relations Professional	Community Engagement Professional	2	2	3	3	3	3	3	3	3	3

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Surveyors and Engineering Professionals	Surveyor	Surveyor	5	6	7	8	9	9	9	9	9	9
	Chemical Engineer	Chemical Engineer	2	2	2	2	2	2	2	2	2	2
	Materials Engineer	Metallurgical Engineer	5	5	5	6	7	7	7	7	7	7
	Civil Engineer	Civil Engineer	1	1	1	2	2	2	2	2	2	2
	Geotechnical Engineer	Tailings Manager	0	0	0	1	1	1	1	1	1	1
	Electrical Engineer	Electrical Engineer	17	22	21	22	22	22	22	22	22	22
	Electronics Engineer	Control Systems Engineer	5	5	5	5	5	5	5	5	5	5
	Industrial Engineers	Industrial Engineer	4	4	4	4	4	4	4	4	4	4
	Mechanical Engineer	Mechanical Engineer	45	49	48	49	50	50	50	50	50	50
	Production or Plant Engineer	Production or Plant Engineer	41	43	45	46	47	47	47	47	47	47
	Mining Engineer	Mining Engineer	14	20	22	24	25	25	25	25	25	25
	Environmental Engineer	Environmental Engineer	3	3	4	4	4	4	4	4	4	4
	Chemist	Chemist	0	0	0	1	2	2	2	2	2	2
Natural and Physical Science Professionals	Environmental Consultant	Environmental Consultant	3	3	3	3	3	3	3	3	3	3
	Environmental Scientist	Environmental Scientist	3	3	5	5	6	6	6	6	6	6
	Geologist	Geologist	19	30	26	26	26	26	26	25	25	25
	Geophysicist	Geophysicist	0	0	1	1	1	1	1	1	1	1
	Metallurgist	Metallurgist	7	9	11	11	11	11	11	11	11	11
Occupational and Environmental Health Professionals	Environmental Health Officer	Radiation Hygiene Specialist	0	0	1	1	1	1	1	1	1	1
	Occupational Health and Safety Professional	Occupational Health and Safety Professional	12	13	15	15	15	15	15	15	15	15
ICT Professionals	ICT Business and Systems Analyst	ICT Business Analyst	9	9	9	9	9	9	9	9	9	9
Engineering, ICT and Science Technicians	Earth Science Technician	Environment & Rehabilitation Technician	1	1	1	1	1	1	1	1	1	1

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	Earth Science Technician	Geological Technician	0	0	1	1	1	1	1	1	1	1
	Science Technician	Laboratory Technician	0	1	2	5	13	13	13	13	13	13
	Civil Engineering Draftsperson	Civil Engineering Draftsperson	0	0	1	1	1	1	1	1	1	1
	Electrical Engineering Technician	Electrical Technician	14	14	14	15	17	17	17	17	17	17
	Electronics Engineering Technician	Electronic Technician	1	1	1	1	1	1	1	1	1	1
	Mechanical Engineering Technician	Mechanical Technician	40	40	43	44	45	45	45	45	45	45
	Safety Inspector	Safety Officer	0	0	0	1	1	1	1	1	1	1
	Maintenance Planner	Maintenance Planner	43	49	49	50	50	50	50	50	50	50
	Metallurgical Technician	Metallurgical Technician	40	40	41	41	41	41	41	40	40	40
	Mine Deputy	Mine Deputy	4	4	4	4	4	4	4	4	4	4
		ICT Technician	1	1	1	2	2	2	2	2	2	2
	ICT Support Technician	Telecommunications Technician	0	0	0	0	1	1	1	1	1	1
	Telecommunications Technician	Instrumentation Technician	5	5	7	7	7	7	7	7	7	7
	Instrumentation Technician	Automotive Electrician	20	20	20	20	20	20	20	20	20	20
Trades Workers	Motor Mechanic - General	Motor Mechanic - General	4	4	4	4	4	4	4	4	4	4
	Motor Mechanic - Diesel	Motor Mechanic - Diesel	173	173	174	187	209	209	209	209	209	209
	Sheetmetal Trades Worker	Sheetmetal Trades Worker	2	2	2	2	2	2	2	2	2	2
	Welder	Welder	11	11	12	14	17	17	17	17	17	17
	Metal Fabricator	Metal Fabricator/Boilermaker	43	45	45	45	45	45	45	45	45	45
	Metal Fitter	Fitter	180	192	193	200	209	209	209	209	209	209
	Metal Machinist	Metal Machinist	3	3	3	3	3	3	3	3	3	3
	Plumber	Plumber	0	0	1	1	2	2	2	2	2	2
	Electrician	Electrician	92	100	100	107	115	115	115	115	115	115
	Airconditioning and Refrigeration Mechanic	Airconditioning and Refrigeration Mechanic	8	8	8	8	9	9	9	9	9	9
	Electronic Instrument Trades Worker	Instrumentation Fitter	14	14	14	14	14	14	14	14	14	14
Hospitality Workers	Other Hospitality Worker	Village Support Worker	9	9	9	16	23	23	23	23	23	23

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Clerical and Administrative Workers	Contract, Program and Project Administrator	Administration Manager/Officer	16	18	19	19	20	20	20	20	20	20
	Office Manager	Office Manager	0	0	0	0	1	1	1	1	1	1
	Personal Assistant	Personal Assistant	0	0	1	1	1	1	1	1	1	1
	Secretary	Secretary	0	0	0	1	1	1	1	1	1	1
	General Clerk	General Clerk	47	49	52	54	55	55	55	53	53	53
	Receptionist	Receptionist	0	0	1	1	1	1	1	1	1	1
	Accounting Clerks and Bookkeeper	Accounting Clerks and Bookkeeper	1	1	2	2	2	2	2	2	2	2
	Purchasing Officer	Purchasing Officer	19	19	20	22	23	23	23	23	23	23
	Warehouse Administrator	Warehouse/Logistics Coordinator	30	30	30	30	30	30	30	30	30	30
Stationary Plant Operators	Crane, Hoist and Lift Operator	Crane, Hoist and Lift Operator	10	10	10	10	10	10	10	10	10	10
	Driller	Driller	30	30	30	35	44	44	44	44	44	44
	Miner	Miner	387	387	389	392	401	401	401	399	399	399
	Shot Firer	Shot Firer	13	13	14	15	15	15	15	14	14	14
	Chemical Production Machine Operators	Operations Team Leader	62	65	65	65	65	65	65	65	65	65
	Chemical Production Machine Operators	Production Worker	557	557	557	557	563	568	568	568	568	568
	Chemical Production Machine Operators	Plant Technician	0	0	3	3	3	3	3	3	3	3
	Other Stationary Plant Operator	Stationary Plant Operator	135	146	151	156	174	174	174	170	170	170
	Bulk Materials Handling Plant Operator	Bulk Materials Handling Plant Operator	0	0	0	0	0	0	0	0	0	0
	Waste Water or Water Plant Operator	Waste Water or Water Plant Operator	2	2	2	2	4	4	4	4	4	4
Mobile Plant Operator	Earthmoving Plant Operator	Mobile Plant Operator	73	80	95	116	178	178	178	177	177	177

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Road and Rail Drivers	Truck Driver	Truck Driver	48	90	141	144	146	146	146	138	138	138
Storepersons	Storeperson	Storeperson	22	23	23	23	23	23	23	23	23	23
Cleaners	Cleaner	Cleaner	10	11	12	12	13	13	13	13	13	13
Construction and Mining Labourers	Mining Support Worker	Driller's Assistant	30	30	31	33	33	33	33	33	33	33
	Mining Support Worker	Mining Support Worker	25	29	28	38	48	48	48	48	48	48
	Mining Support Worker	Maintenance Team Leader	33	33	33	33	33	33	33	33	33	33
		Maintenance Support Worker	22	23	23	23	23	23	23	23	23	23
		Apprentice Electrician	31	31	31	31	31	33	33	33	33	33
		Apprentice Auto Electrician	0	4	4	4	4	4	4	4	4	4
		Apprentice Fabricator	6	6	6	6	6	6	6	6	6	6
		Apprentice Fitter: Instrumentation	8	8	8	8	8	8	8	8	8	8
		Apprentice Fitter: Light Vehicle	0	3	3	3	3	3	3	3	3	3
		Apprentice Fitter: Mechanical	28	28	28	28	28	30	30	30	30	30
		Apprentice Instrument / Electrical Technician	0	0	0	0	0	1	1	1	1	1
		Apprentice Mechanic: Heavy Diesel	2	6	6	6	8	8	8	8	8	8
		Apprentice Welder	4	4	4	4	4	4	4	4	4	4
		Trainee (Cadet)	45	45	45	45	45	49	53	53	53	53
		Trainee (Office)	1	1	1	1	1	1	1	1	1	1
		Trainee (Operator)	16	16	16	16	16	16	16	16	16	16
		Trainee (OHS)	4	4	4	4	4	4	4	4	4	4
		Other (First Aid, Emergency Worker, Security)	5	5	7.4	7.8	8.1	8.1	8.1	5.7	5.7	5.7
		TOTALS	2769	2923	3035	3153	3345	3357	3360	3338	3338	3338
		GROWTH	122	154	112	118	192	12	2	-22	0	0

		CUM GROWTH	122	276	388	507	698	711	713	691	691	691
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Appendix 3: Job Openings with Probability Weighting and not including Staff Turnover

ANZSCO GROUP	ANZSCO OCCUPATION	SURVEY TERMINOLOGY	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	TOTAL
Specialist Managers	Exploration Manager	Exploration Manager	0	0	-1	-1	-2	0	0	0	0	0	-4
	Construction Manager	Construction Manager	0	4	0	0	0	-2	-2	0	0	0	1
	Engineering Manager	Engineering Manager	0	0	0	0	0	0	0	0	0	0	1
	Production Manager (Mining)	Mine Manager	0	0	1	0	0	0	0	-1	0	0	1
	Production Manager (Mining)	Operations Manager	0	0	0	0	0	0	0	0	0	0	0
	Production Manager (Mining)	Production/Processing Manager	0	0	1	0	0	0	0	0	0	0	1
	Production Manager (Mining)	Materials/Ore Handling Manager	0	0	0	0	0	0	0	0	0	0	0
	Supply and Distribution Manager	Supply Manager	0	0	0	0	0	0	0	0	0	0	0
	Environmental Manager	Environmental Manager	0	0	1	0	0	0	0	-1	0	0	0
	Laboratory Manager	Laboratory Manager	0	0	0	0	0	0	0	0	0	0	0
	Quality Manager	Quality Manager	0	0	0	0	0	0	0	0	0	0	0
	Facilities Manager	Site Manager	0	0	0	0	0	0	0	0	0	0	0
	Other Manager	Maintenance Manager	0	0	1	1	0	0	0	0	0	0	2
	Other Manager	Health, Safety & Environment Manager	0	1	0	0	0	0	0	0	0	0	1
	Other Manager	Other Manager	0	0	1	1	0	0	0	0	0	0	1
Business, Human Resource and Marketing Professionals	Accountant	Accountant	0	0	2	1	1	0	0	0	0	0	4

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	Human Resource Professional	Human Resource Professional	0	0	0	0	0	0	0	0	0	0	0
	Training and Development Professional	Training and Development Professional	0	0	0	0	1	0	0	0	0	0	2
	Public Relations Professional	Community Engagement Professional	0	0	1	0	0	0	0	0	0	0	1
Surveyors and Engineering Professionals	Surveyor	Surveyor	0	1	1	1	0	0	0	0	0	0	4
	Chemical Engineer	Chemical Engineer	0	0	0	0	0	0	0	0	0	0	0
	Materials Engineer	Metallurgical Engineer	0	0	0	1	0	0	0	0	0	0	2
	Civil Engineer	Civil Engineer	0	0	0	0	0	0	0	0	0	0	1
	Geotechnical Engineer	Tailings Manager	0	0	0	0	0	0	0	0	0	0	1
	Electrical Engineer	Electrical Engineer	1	5	-1	1	1	0	0	0	0	0	6
	Electronics Engineer	Control Systems Engineer	0	0	0	0	0	0	0	0	0	0	0
	Industrial Engineers	Industrial Engineer	0	0	0	0	0	0	0	0	0	0	0
	Mechanical Engineer	Mechanical Engineer	2	4	-1	1	1	0	0	0	0	0	7
	Production or Plant Engineer	Production or Plant Engineer	2	2	2	1	1	0	0	0	0	0	8
	Mining Engineer	Mining Engineer	2	7	1	3	1	0	0	0	0	0	13
	Environmental Engineer	Environmental Engineer	0	0	1	0	0	0	0	0	0	0	1
	Chemist	Chemist	0	0	0	1	1	0	0	0	0	0	2
Natural and Physical Science Professionals	Environmental Consultant	Environmental Consultant	0	0	0	0	0	0	0	0	0	0	0
	Environmental Scientist	Environmental Scientist	0	0	1	1	1	0	0	0	0	0	3
	Geologist	Geologist	0	11	-5	0	0	0	0	-1	0	0	6
	Geophysicist	Geophysicist	0	0	1	0	0	0	0	0	0	0	1
	Metallurgist	Metallurgist	0	2	2	1	0	0	0	0	0	0	4
Occupational and Environmental Health	Environmental Health Officer	Radiation Hygiene Specialist	0	0	1	0	0	0	0	0	0	0	1

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Professionals													
	Occupational Health and Safety Professional	Occupational Health and Safety Professional	0	1	2	0	0	0	0	0	0	0	3
ICT Professionals	ICT Business and Systems Analyst	ICT Business Analyst	0	0	0	0	0	0	0	0	0	0	0
Engineering, ICT and Science Technicians	Earth Science Technician	Environment & Rehabilitation Technician	0	0	0	0	0	0	0	0	0	0	0
	Earth Science Technician	Geological Technician	0	0	1	0	0	0	0	0	0	0	1
	Science Technician	Laboratory Technician	0	0	1	4	8	0	0	0	0	0	13
	Civil Engineering Draftsperson	Civil Engineering Draftsperson	0	0	1	0	0	0	0	0	0	0	1
	Electrical Engineering Technician	Electrical Technician	0	0	0	1	1	0	0	0	0	0	3
	Electronics Engineering Technician	Electronic Technician	0	0	0	0	0	0	0	0	0	0	0
	Mechanical Engineering Technician	Mechanical Technician	0	0	3	1	2	0	0	0	0	0	5
	Safety Inspector	Safety Officer	0	0	0	1	0	0	0	0	0	0	1
	Maintenance Planner	Maintenance Planner	0	6	0	1	0	0	0	0	0	0	7
	Metallurgical Technician	Metallurgical Technician	0	0	1	0	0	0	0	-1	0	0	0
	Mine Deputy	Mine Deputy	0	0	0	0	0	0	0	0	0	0	0
	ICT Support Technician	ICT Technician	0	0	0	1	0	0	0	0	0	0	1
	Telecommunications Technician	Telecommunications Technician	0	0	0	0	1	0	0	0	0	0	1
	Instrumentation Technician	Instrumentation Technician	0	0	2	0	0	0	0	0	0	0	2
Trades Workers	Automotive Electrician	Automotive Electrician	0	0	0	0	0	0	0	0	0	0	0
	Motor Mechanic - General	Motor Mechanic - General	0	0	0	0	0	0	0	0	0	0	0
	Motor Mechanic - Diesel	Motor Mechanic - Diesel	3	0	0	13	22	0	0	0	0	0	38

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	Sheetmetal Trades Worker	Sheetmetal Trades Worker	0	0	0	0	0	0	0	0	0	0	0
	Welder	Welder	0	0	1	2	3	0	0	0	0	0	6
	Metal Fabricator	Metal Fabricator/Boilermaker	3	2	0	0	0	0	0	0	0	0	5
	Metal Fitter	Fitter	8	12	1	7	9	0	0	0	0	0	37
	Metal Machinist	Metal Machinist	0	0	0	0	0	0	0	0	0	0	0
	Plumber	Plumber	0	0	1	0	1	0	0	0	0	0	2
	Electrician	Electrician	2	8	0	7	8	0	0	0	0	0	26
	Airconditioning and Refrigeration Mechanic	Airconditioning and Refrigeration Mechanic	0	0	0	0	1	0	0	0	0	0	1
	Electronic Instrument Trades Worker	Instrumentation Fitter	0	0	0	0	0	0	0	0	0	0	0
Hospitality Workers	Other Hospitality Worker	Village Support Worker	0	0	0	7	7	0	0	0	0	0	14
Clerical and Administrative Workers	Contract, Program and Project Administrator	Administration Manager/Officer	0	2	1	0	1	0	0	0	0	0	4
	Office Manager	Office Manager	0	0	0	0	0	0	0	0	0	0	1
	Personal Assistant	Personal Assistant	0	0	1	1	0	0	0	0	0	0	1
	Secretary	Secretary	0	0	0	0	0	0	0	0	0	0	1
	General Clerk	General Clerk	0	2	3	2	1	0	0	-2	0	0	6
	Receptionist	Receptionist	0	0	1	0	0	0	0	0	0	0	1
	Accounting Clerks and Bookkeeper	Accounting Clerks and Bookkeeper	0	0	1	1	0	0	0	0	0	0	1
	Purchasing Officer	Purchasing Officer	0	0	1	2	1	0	0	0	0	0	4
	Warehouse Administrator	Warehouse/Logistics Coordinator	0	0	0	0	0	0	0	0	0	0	0
Stationary Plant Operators	Crane, Hoist and Lift Operator	Crane, Hoist and Lift Operator	6	0	0	0	0	0	0	0	0	0	6
	Driller	Driller	8	0	0	5	8	0	0	0	0	0	21
	Miner	Miner	0	0	2	3	9	0	0	-2	0	0	12
	Shot Firer	Shot Firer	2	0	1	0	0	0	0	-1	0	0	3

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	Chemical Production Machine Operators	Operations Team Leader	0	3	0	0	0	0	0	0	0	0	3
	Chemical Production Machine Operators	Production Worker	0	0	0	0	6	6	0	0	0	0	11
	Chemical Production Machine Operators	Plant Technician	0	0	3	0	0	0	0	0	0	0	3
	Other Stationary Plant Operator	Stationary Plant Operator	11	11	5	6	17	0	0	-4	0	0	47
	Bulk Materials Handling Plant Operator	Bulk Materials Handling Plant Operator	0	0	0	0	0	0	0	0	0	0	0
	Waste Water or Water Plant Operator	Waste Water or Water Plant Operator	0	0	0	0	2	0	0	0	0	0	2
Mobile Plant Operator	Earthmoving Plant Operator	Mobile Plant Operator	30	6	15	21	62	0	0	-1	0	0	134
Road and Rail Drivers	Truck Driver	Truck Driver	38	42	51	3	2	0	0	-8	0	0	128
Storepersons	Storeperson	Storeperson	0	1	0	0	0	0	0	0	0	0	1
Cleaners	Cleaner	Cleaner	0	1	1	1	1	0	0	0	0	0	3
Construction and Mining Labourers	Mining Support Worker	Driller's Assistant	0	0	1	3	0	0	0	0	0	0	3
	Mining Support Worker	Mining Support Worker	5	4	-1	10	11	0	0	0	0	0	28
	Mining Support Worker	Maintenance Team Leader	0	0	0	0	0	0	0	0	0	0	0
	Mining Support Worker	Maintenance Support Worker	0	1	0	0	0	0	0	0	0	0	1
		Apprentice Electrician	0	0	0	0	0	2	0	0	0	0	2
		Apprentice Auto Electrician	0	4	0	0	0	0	0	0	0	0	4
		Apprentice Fabricator	0	0	0	0	0	0	0	0	0	0	0
		Apprentice Fitter: Instrumentation	0	0	0	0	0	0	0	0	0	0	0
		Apprentice Fitter: Light Vehicle	0	3	0	0	0	0	0	0	0	0	3

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		Apprentice Fitter: Mechanical	0	0	0	0	0	2	0	0	0	0	2
		Apprentice Instrument / Electrical Technician	0	0	0	0	0	0	0	0	0	0	1
		Apprentice Mechanic: Heavy Diesel	0	4	0	0	2	0	0	0	0	0	6
		Apprentice Welder	0	0	0	0	0	0	0	0	0	0	0
		Trainee (Cadet)	0	0	0	0	0	4	4	0	0	0	8
		Trainee (Office)	0	0	0	0	0	0	0	0	0	0	0
		Trainee (Operator)	0	0	0	0	0	0	0	0	0	0	0
		Trainee (OHS)	0	0	0	0	0	0	0	0	0	0	0
		Other (First Aid, Emergency Worker, Security)	0	0	2.4	0.4	0.3	0	0	-2.4	0	0	1
		TOTAL JOB OPENINGS (ANNUAL)	122	154	112	118	192	12	2	-22	0	0	691
		CUM JOB OPENINGS	122	276	388	507	698	711	713	691	691	691	

Appendix 4: Job Openings with Probability Weighting and including Staff Turnover

ANZSCO GROUP	ANZSCO OCCUPATION	SURVEY TERMINOLOGY	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	TOTAL
Specialist Managers	Exploration Manager	Exploration Manager	0	0	0	0	0	0	0	0	0	0	4
	Construction Manager	Construction Manager	0	4	1	1	1	-1	-1	0	0	0	7
	Engineering Manager	Engineering Manager	0	1	1	1	1	1	1	1	1	1	10
	Production Manager (Mining)	Mine Manager	0	1	2	2	2	1	1	1	1	1	13
	Production Manager (Mining)	Operations Manager	0	1	1	1	1	1	1	1	1	1	6
	Production Manager (Mining)	Production/Processing Manager	0	1	2	1	1	1	1	1	1	1	12
	Production Manager (Mining)	Materials/Ore Handling Manager	0	1	1	1	1	1	1	1	1	1	10
	Supply and Distribution Manager	Supply Manager	0	0	1	0	0	0	0	0	0	0	3
	Environmental Manager	Environmental Manager	0	0	1	1	1	1	1	0	0	0	4
	Laboratory Manager	Laboratory Manager	0	0	0	0	0	0	0	0	0	0	0
	Quality Manager	Quality Manager	0	1	1	1	1	1	1	1	1	1	6
	Facilities Manager	Site Manager	0	0	0	1	0	0	0	0	0	0	3
	Other Manager	Maintenance Manager	0	2	3	3	3	2	2	2	2	2	22
	Other Manager	Health, Safety & Environment Manager	0	1	1	1	1	1	1	1	1	1	6
	Other Manager	Other Manager	0	3	4	4	3	3	3	3	3	3	30
Business, Human Resource and Marketing Professionals	Accountant	Accountant	0	3	5	4	4	4	4	4	4	4	34
	Human Resource Professional	Human Resource Professional	0	2	2	2	2	2	2	2	2	2	17

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	Training and Development Professional	Training and Development Professional	0	2	2	3	3	3	3	3	3	3	23
	Public Relations Professional	Community Engagement Professional	0	1	1	1	1	1	1	1	1	1	6
Surveyors and Engineering Professionals	Surveyor	Surveyor	0	2	3	3	2	2	2	2	2	2	20
	Chemical Engineer	Chemical Engineer	0	0	1	0	0	0	0	0	0	0	3
	Materials Engineer	Metallurgical Engineer	0	1	1	2	1	1	1	1	1	1	9
	Civil Engineer	Civil Engineer	0	0	1	0	1	0	0	0	0	0	3
	Geotechnical Engineer	Tailings Manager	0	0	0	0	0	0	0	0	0	0	2
	Electrical Engineer	Electrical Engineer	1	7	1	3	3	2	2	2	2	2	27
	Electronics Engineer	Control Systems Engineer	0	1	1	1	1	1	1	1	1	1	5
	Industrial Engineers	Industrial Engineer	0	0	0	0	0	0	0	0	0	0	4
	Mechanical Engineer	Mechanical Engineer	2	10	5	7	7	7	7	7	7	7	64
	Production or Plant Engineer	Production or Plant Engineer	2	9	8	8	8	7	7	7	7	7	72
	Mining Engineer	Mining Engineer	2	10	7	9	7	7	7	7	7	7	68
	Environmental Engineer	Environmental Engineer	0	0	1	1	1	1	1	1	1	1	6
	Chemist	Chemist	0	0	0	1	1	0	0	0	0	0	4
Natural and Physical Science Professionals	Environmental Consultant	Environmental Consultant	0	1	1	1	1	1	1	1	1	1	8
	Environmental Scientist	Environmental Scientist	0	1	2	1	1	1	1	1	1	1	10
	Geologist	Geologist	0	17	4	7	7	7	7	6	7	7	69
	Geophysicist	Geophysicist	0	0	1	0	0	0	0	0	0	0	1
	Metallurgist	Metallurgist	0	4	4	3	3	3	3	3	3	3	26
Occupational and Environmental Health Professionals	Environmental Health Officer	Radiation Hygiene Specialist	0	0	1	0	1	0	0	0	0	0	2

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	Occupational Health and Safety Professional	Occupational Health and Safety Professional	0	3	4	2	2	2	2	2	2	2	22
ICT Professionals	ICT Business and Systems Analyst	ICT Business Analyst	0	1	1	1	1	1	1	1	1	1	10
Engineering, ICT and Science Technicians	Earth Science Technician	Environment & Rehabilitation Technician	0	0	0	0	0	0	0	0	0	0	3
	Earth Science Technician	Geological Technician	0	0	1	0	0	0	0	0	0	0	1
	Science Technician	Laboratory Technician	0	0	1	4	9	2	2	2	2	2	26
	Civil Engineering Draftsperson	Civil Engineering Draftsperson	0	0	1	0	0	0	0	0	0	0	1
	Electrical Engineering Technician	Electrical Technician	0	3	3	4	4	3	3	3	3	3	28
	Electronics Engineering Technician	Electronic Technician	0	0	0	0	0	0	0	0	0	0	3
	Mechanical Engineering Technician	Mechanical Technician	0	6	9	7	9	7	7	7	7	7	66
	Safety Inspector	Safety Officer	0	0	0	1	0	0	0	0	0	0	2
	Maintenance Planner	Maintenance Planner	0	11	6	7	6	6	6	6	6	6	58
	Metallurgical Technician	Metallurgical Technician	0	4	5	5	5	5	5	4	4	4	40
	Mine Deputy	Mine Deputy	0	1	1	1	1	1	1	1	1	1	10
	ICT Support Technician	ICT Technician	0	0	0	1	0	0	0	0	0	0	2
	Telecommunications Technician	Telecommunications Technician	0	0	0	0	1	0	0	0	0	0	2
	Instrumentation Technician	Instrumentation Technician	0	1	3	2	2	2	2	2	2	2	16
Trades Workers	Automotive Electrician	Automotive Electrician	0	2	2	2	2	2	2	2	2	2	18
	Motor Mechanic - General	Motor Mechanic - General	0	0	1	0	0	0	0	0	0	0	4
	Motor Mechanic - Diesel	Motor Mechanic - Diesel	3	18	18	31	42	25	25	25	25	25	236
	Sheetmetal Trades Worker	Sheetmetal Trades Worker	0	0	0	0	0	0	0	0	0	0	2

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	Welder	Welder	0	1	3	4	4	2	2	2	2	2	23
	Metal Fabricator	Metal Fabricator/Boilermaker	3	7	5	5	5	5	5	5	5	5	49
	Metal Fitter	Fitter	8	31	21	27	30	23	23	23	23	23	230
	Metal Machinist	Metal Machinist	0	0	0	0	0	0	0	0	0	0	2
	Plumber	Plumber	0	0	1	0	1	0	0	0	0	0	3
	Electrician	Electrician	2	17	11	17	20	13	13	13	13	13	133
	Airconditioning and Refrigeration Mechanic	Airconditioning and Refrigeration Mechanic	0	1	1	1	2	1	1	1	1	1	10
	Electronic Instrument Trades Worker	Instrumentation Fitter	0	1	1	1	1	1	1	1	1	1	13
Hospitality Workers	Other Hospitality Worker	Village Support Worker	0	2	2	9	11	6	6	6	6	6	51
Clerical and Administrative Workers	Contract, Program and Project Administrator	Administration Manager/Officer	0	4	3	2	3	2	2	2	2	2	23
	Office Manager	Office Manager	0	0	0	0	0	0	0	0	0	0	1
	Personal Assistant	Personal Assistant	0	0	1	1	0	0	0	0	0	0	3
	Secretary	Secretary	0	0	0	0	0	0	0	0	0	0	2
	General Clerk	General Clerk	0	6	7	7	6	6	6	4	5	5	53
	Receptionist	Receptionist	0	0	1	0	0	0	0	0	0	0	2
	Accounting Clerks and Bookkeeper	Accounting Clerks and Bookkeeper	0	0	1	1	0	0	0	0	0	0	4
	Purchasing Officer	Purchasing Officer	0	2	3	4	3	2	2	2	2	2	23
	Warehouse Administrator	Warehouse/Logistics Coordinator	0	4	4	4	4	4	4	4	4	4	34
Stationary Plant Operators	Crane, Hoist and Lift Operator	Crane, Hoist and Lift Operator	6	1	1	1	1	1	1	1	1	1	15
	Driller	Driller	8	3	3	8	12	5	5	5	5	5	60
	Miner	Miner	0	39	41	42	49	42	42	40	42	42	378
	Shot Firer	Shot Firer	2	1	2	2	2	2	2	1	1	1	16

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	Chemical Production Machine Operators	Operations Team Leader	0	9	7	7	7	7	7	7	7	7	61
	Chemical Production Machine Operators	Production Worker	0	28	28	28	33	34	30	30	30	30	269
	Chemical Production Machine Operators	Plant Technician	0	0	3	1	1	1	1	1	1	1	6
	Other Stationary Plant Operator	Stationary Plant Operator	11	28	22	24	37	21	21	18	21	21	224
	Bulk Materials Handling Plant Operator	Bulk Materials Handling Plant Operator	0	0	0	0	0	0	0	0	0	0	0
	Waste Water or Water Plant Operator	Waste Water or Water Plant Operator	0	0	0	1	2	1	1	1	1	1	6
Mobile Plant Operator	Earthmoving Plant Operator	Mobile Plant Operator	30	22	32	40	86	39	39	38	39	39	404
Road and Rail Drivers	Truck Driver	Truck Driver	38	49	64	24	24	22	22	15	21	21	298
Storepersons	Storeperson	Storeperson	0	3	2	2	2	2	2	2	2	2	18
Cleaners	Cleaner	Cleaner	0	2	3	2	3	2	2	2	2	2	20
Construction and Mining Labourers	Mining Support Worker	Driller's Assistant	0	3	4	6	4	4	4	4	4	4	35
	Mining Support Worker	Mining Support Worker	5	9	4	15	19	11	11	11	11	11	106
	Mining Support Worker	Maintenance Team Leader	0	5	5	5	5	5	5	5	5	5	45
	Mining Support Worker	Maintenance Support Worker	0	2	1	1	1	1	1	1	1	1	11
		Apprentice Electrician	0	3	3	3	3	5	3	3	3	3	32
		Apprentice Auto Electrician	0	4	0	0	0	0	0	0	0	0	7
		Apprentice Fabricator	0	0	0	0	0	0	0	0	0	0	4
		Apprentice Fitter: Instrumentation	0	1	1	1	1	1	1	1	1	1	5
		Apprentice Fitter: Light Vehicle	0	3	0	0	0	0	0	0	0	0	5

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	Apprentice Fitter: Mechanical	0	2	2	2	2	4	2	2	2	2	22
	Apprentice Instrument / Electrical Technician	0	0	0	0	0	0	0	0	0	0	1
	Apprentice Mechanic: Heavy Diesel	0	4	1	1	3	1	1	1	1	1	13
	Apprentice Welder	0	0	0	0	0	1	0	0	0	0	4
	Trainee (Cadet)	0	5	5	5	5	9	10	7	7	7	61
	Trainee (Office)	0	0	0	0	0	0	0	0	0	0	1
	Trainee (Operator)	0	2	2	2	2	2	2	2	2	2	14
	Trainee (OHS)	0	0	0	0	0	0	0	0	0	0	4
	Other (First Aid, Emergency Worker, Security)	0	1	3	2	2	1	1	-1	1	1	10
	TOTAL JOB OPENINGS (ANNUAL)	122	446	427	453	552	411	403	379	397	397	3987
	CUM JOB OPENINGS	122	569	996	1449	2001	2412	2815	3194	3591	3987	

Appendix 5: Demand by Qualification with weighting and including staff turnover

Nominal Qualification	Alternate Qualification	Occupations	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total
Bachelor of Commerce (Accounting)	Bachelor of Business (Accounting)	Accountant	0	3	5	4	4	4	4	4	4	4	34
Bachelor of Health Science (Safety and Health)	Cert IV/ Diploma of Occupational Health and Safety	Occupational Health and Safety Professional / Safety and Training Officer / Safety Officer	0	4	5	4	4	4	4	4	4	4	36
Bachelor of Geoinformatics and Surveying	Mine Surveyor's Certificate	Surveyor	0	2	3	3	2	2	2	2	2	2	20
Bachelor of Engineering (Civil)	Bachelor of Civil and Structural Engineering	Civil Engineer	0	0	1	0	1	0	0	0	0	0	3
Bachelor of Engineering (Electrical)	Bachelor of Engineering in Electrical and Sustainable Energy Engineering	Electrical Engineer	1	7	1	3	3	2	2	2	2	2	27
Bachelor of Engineering (Mechanical)	Bachelor of Engineering - Mechanical and Advanced Manufacturing	Mechanical Engineer/Production/Plant Engineer/Reliability Engineer	2	10	5	7	7	7	7	7	7	7	64
Bachelor of Engineering (Mining)		Mining Engineer	2	9	8	8	8	7	7	7	7	7	72

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Bachelor of Engineering (Environmental)		Environmental Engineer	2	10	7	9	7	7	7	7	7	7	7	68
Bachelor of Science (Chemistry)		Chemist	0	0	0	1	1	0	0	0	0	0	0	4
Bachelor of Applied Science (Environmental Management)	Diploma of Environmental Management	Environmental Scientist	0	1	2	1	1	1	1	1	1	1	1	10
Bachelor of Science (Mineral Geoscience)	Diploma of Geoscience	Geologist	0	17	4	7	7	7	7	6	7	7	7	69
Bachelor of Applied Science (Metallurgy)	Diploma of Engineering (Manufacturing Technology - Metallurgy)	Metallurgist	0	4	4	3	3	3	3	3	3	3	3	26
Diploma of ESI (Power Systems)	Advanced Diploma of ESI (Power Systems)	Electrical Technician	0	3	3	4	4	3	3	3	3	3	3	28
Diploma of Engineering (Technical or Advanced Trade)	Advanced Diploma of Engineering	Mechanical Technician	0	6	9	7	9	7	7	7	7	7	7	66
Diploma of Engineering (Manufacturing Technology - Metallurgy)	Advanced Diploma of Engineering - Metallurgy	Metallurgical Technician	0	4	5	5	5	5	5	4	4	4	4	40

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Certificate IV in Telecommunications	Certificate III in Electrotechnology Communications	Telecommunications Technician	0	0	0	0	1	0	0	0	0	0	2
Certificate IV in Electrical (Instrumentation)	Certificate III in Instrumentation and Control Trade	Instrumentation Technician/Fitter	0	1	3	2	2	2	2	2	2	2	16
Certificate III in Automotive Mechanical Technology Trade		Motor Mechanic - Diesel	3	18	18	31	42	25	25	25	25	25	236
Certificate III in Engineering (Fabrication Trade)		Boilermaker/Welder/Metal Fabricator	3	7	5	5	5	5	5	5	5	5	49
Certificate III in Engineering (Mechanical Trade)		Fitter	8	31	21	27	30	23	23	23	23	23	230
Certificate III in Electrotechnology Electrician	Certificate III in Engineering (Electrical/Electronic Trade)	Electrician	2	17	11	17	20	13	13	13	13	13	133
Certificate III in Mining Exploration		Driller	10	4	4	28	43	13	13	13	13	13	153
Certificate II to IV in Resource Processing		Miner/Plant Technician/Stationary Plant Operator	11	66	66	67	86	64	64	58	63	63	608

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Certificate II to IV in Surface Extraction Operations	Mobile Plant Operator	30	22	32	40	86	39	39	38	39	39	404
HC and/or MC Class Licenses	Truck Driver	38	49	64	24	24	22	22	15	21	21	298
Dual Certificate II Program in Resources IWP and Surface Extraction	Mining Support Worker / Driller's Assistant	5	12	8	21	22	15	15	15	15	15	141
TOTAL		116	307	291	330	427	278	278	262	275	275	2839

Appendix 6: Demand for Qualifications by Occupation with weighting and including staff turnover

	Demand by Occupation											Qualification			
												Higher Education		VET	
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total	1	2	1	2
Accountant	0	3	5	4	4	4	4	4	4	4	34	Bachelor of Commerce (Accounting)	Bachelor of Business (Accounting)		
Training and Development (Safety and Training)	0	1	1	1	2	1	1	1	1	1	12	Bachelor of Health Science (Safety and Health)	Bachelor of Science (Health, Safety and Environment)	Certificate IV in Occupational Health and Safety	Diploma of Occupational Health and Safety
Surveyor	0	2	3	3	2	2	2	2	2	2	20	Bachelor of Geoinformatics and Surveying	Master of Surveying	Mine Surveyor's Certificate	
Civil Engineer	0	0	1	0	1	0	0	0	0	0	3	Bachelor of Engineering (Civil)	Bachelor of Civil and Structural Engineering	Advanced Diploma of Civil Construction Management	Advanced Diploma of Civil Construction Design Management
Electrical Engineer	1	7	1	3	3	2	2	2	2	2	27	Bachelor of Engineering (Electrical)	Bachelor of Engineering in Electrical and Sustainable Energy Engineering	Diploma of ESI (Power Systems)	Advanced Diploma of ESI (Power Systems)
Mechanical Engineer	2	10	5	7	7	7	7	7	7	7	64	Bachelor of Engineering (Mechanical)		Diploma of Engineering (Technical or Advanced Trade)	Advanced Diploma of Engineering

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Production or Plant Engineer	2	9	8	8	8	7	7	7	7	7	72	Bachelor of Engineering (Mechanical)		Diploma of Engineering (Technical or Advanced Trade)	Advanced Diploma of Engineering
Mining Engineer	2	10	7	9	7	7	7	7	7	7	68	Bachelor of Engineering (Mining)			
Environmental Engineer	0	0	1	1	1	1	1	1	1	1	6	Bachelor of Engineering (Environmental)			
Chemist	0	0	0	1	1	0	0	0	0	0	4	Bachelor of Science (Chemistry)			
Environmental Scientist	0	1	2	1	1	1	1	1	1	1	10	Bachelor of Applied Science (Environmental Management)			
Geologist	0	17	4	7	7	7	7	6	7	7	69	Bachelor of Science (Mineral Geoscience)	Bachelor of Applied Science (Geology)	Diploma of Geoscience	
Metallurgist	0	4	4	3	3	3	3	3	3	3	26	Bachelor of Applied Science (Metallurgy)		Diploma of Engineering (Manufacturing Technology - Metallurgy)	
Occupational Health and Safety Professional	0	3	4	2	2	2	2	2	2	2	22	Bachelor of Health Science (Safety and Health)	Bachelor of Science (Health, Safety and Environment)	Certificate IV in Occupational Health and Safety	Diploma of Occupational Health and Safety
Geological Technician	0	0	1	0	0	0	0	0	0	0	1			Certificate III in Mining Exploration	Diploma of Geoscience

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Electrical Technician	0	3	3	4	4	3	3	3	3	3	28			Diploma of ESI (Power Systems)	Advanced Diploma of ESI (Power Systems)
Mechanical Technician	0	5	14	11	15	9	9	9	9	9	89			Diploma of Engineering (Technical or Advanced Trade)	Advanced Diploma of Engineering
Safety Officer	0	0	0	1	0	0	0	0	0	0	2			Cert IV in Occupational Health and Safety	Diploma of Occupational Health and Safety
Metallurgical Technician	0	4	5	5	5	5	5	4	4	4	40			Diploma of Engineering (Manufacturing Technology - Metallurgy)	Advanced Diploma of Engineering (Metallurgy)
Telecommunications Technician	0	0	0	0	0	0	0	0	0	0	0			Certificate III in Electrotechnology Communications	Certificate IV in Telecommunications
Instrumentation Technician	0	1	3	2	2	2	2	2	2	2	16			Certificate III in Instrumentation and Control	Certificate IV in Electrical (Instrumentation)
Motor Mechanic - Diesel	0	0	1	0	0	0	0	0	0	0	4			Certificate III in Automotive Mechanical Technology Trade	
Welder	0	1	7	10	13	6	6	6	6	6	59			Certificate I in Engineering (Fabrication)	Certificate III in Engineering (Fabrication Trade)

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Metal Fabricator	4	7	5	5	5	5	5	5	5	5	49			Certificate III in Engineering - (Fabrication Trade)	
Fitter	10	31	22	52	65	32	32	32	32	32	342			Certificate III in Engineering (Mechanical Trade)	Certificate IV in Engineering
Electrician	0	0	0	0	0	0	0	0	0	0	3			Certificate III in Electrotechnology Electrician	Certificate III in Engineering (Electrical/Electronic Trade)
Instrumentation Fitter	0	1	1	1	1	1	1	1	1	1	13			Certificate III in Instrumentation and Control Trade	
Driller	8	3	3	8	12	5	5	5	5	5	60			Certificate III in Mining Exploration	Certificate II- IV in Drilling Operations
Miner	0	39	41	42	49	42	42	40	42	42	378			Certificate II to IV in Surface Extraction Operations	Certificate II in Metalliferous Mining Operations (Open Cut)
Stationary Plant Operator	11	28	22	24	37	21	21	18	21	21	224			Certificate II to IV in Resource Processing	Certificate III or IV in Manufactured Mineral Products
Mobile Plant Operator	30	22	32	40	86	39	39	38	39	39	404			Certificate II to IV in Surface Extraction Operations	Certificate II to IV in Surface Extraction Operations
Truck Driver	38	49	64	24	24	22	22	15	21	21	298			HC and/or MC Class Licenses	

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Mining Support Worker	5	9	4	15	19	11	11	11	11	11	106			Dual Certificate II Program in Resources IWP and Surface Extraction	
Driller's Assistant	0	3	4	6	4	4	4	4	4	4	35			Dual Certificate II Program in Resources IWP and Surface Extraction	Certificate II in Drilling Operations