



2014



*Canadian Mining Industry Employment,
Hiring Requirements and Available Talent
10-year Outlook*



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1

BACKGROUND AND OVERVIEW



A cautious business climate lingered over the Canadian mining industry through 2013. Falling commodity prices, restricted access to capital, and global economic uncertainty raised concerns about the risks of undertaking new activities and spurred a cautious mood. Mining employers were reluctant to fill vacancies and focused efforts on streamlining activities; however, volatility is common in the mining sector and while short-term adjustments were needed, employers kept their focus on the human resources (HR) challenges still on the horizon.

The forecasts and occupation-gap analysis presented in this report indicate that over the long term, the Canadian mining industry will continue to face HR challenges. The industry is projected to need more than 120,000 workers by 2024 — nearly two-thirds of the current workforce — with the majority (85 per cent) of projected hires due to replacement requirements. In an expansionary scenario, needs are projected to exceed 135,000 workers and even under a contractionary scenario, the industry will need to hire nearly 100,000 workers — almost half of the current workforce, with the majority of hires (97 per cent) due to replacement requirements.

The Mining Industry Human Resources Council (MiHR) also provides forecasts of available talent for each occupation, which predict the sources of talent to meet the hiring needs of the mining industry. Projections show that the industry will attract slightly more than 63,000 workers in 66 selected occupations over the next 10 years. Gap analysis of hiring requirements compared to available talent for each occupation shows that skill shortages loom in key categories, such as production and development occupations, as well as mid-level management positions.

Efforts to retain and develop the current labour force are essential, as mining seeks long-term solutions to address many of the gaps between hiring requirements and talent. To meet the projected needs, mining organizations will need to implement strategies to diversify their labour pool, make deliberate investments in training and education, and attract workers from particular talent pools such as immigrants, women and Aboriginal peoples.

ABOUT THE REPORT

This report is an update to MiHR's *2013 10-year Outlook* report. It contains new projections and forecasts for both hiring requirements and available talent, based on the most recent data available. In addition, the demographic profile presented here is based on new data recently released by Statistics Canada from the 2011 National Household Survey.

This report is divided into three sections. The first section highlights key economic conditions and trends affecting the mining labour market. The second section presents the new hiring requirements and available talent forecasts. The final section of the report provides a gap analysis for each occupation, along with discussion of trends and recommendations for addressing the various types of gaps.

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ECONOMIC OVERVIEW AND CANADA'S MINING LABOUR FORCE



ECONOMIC OVERVIEW

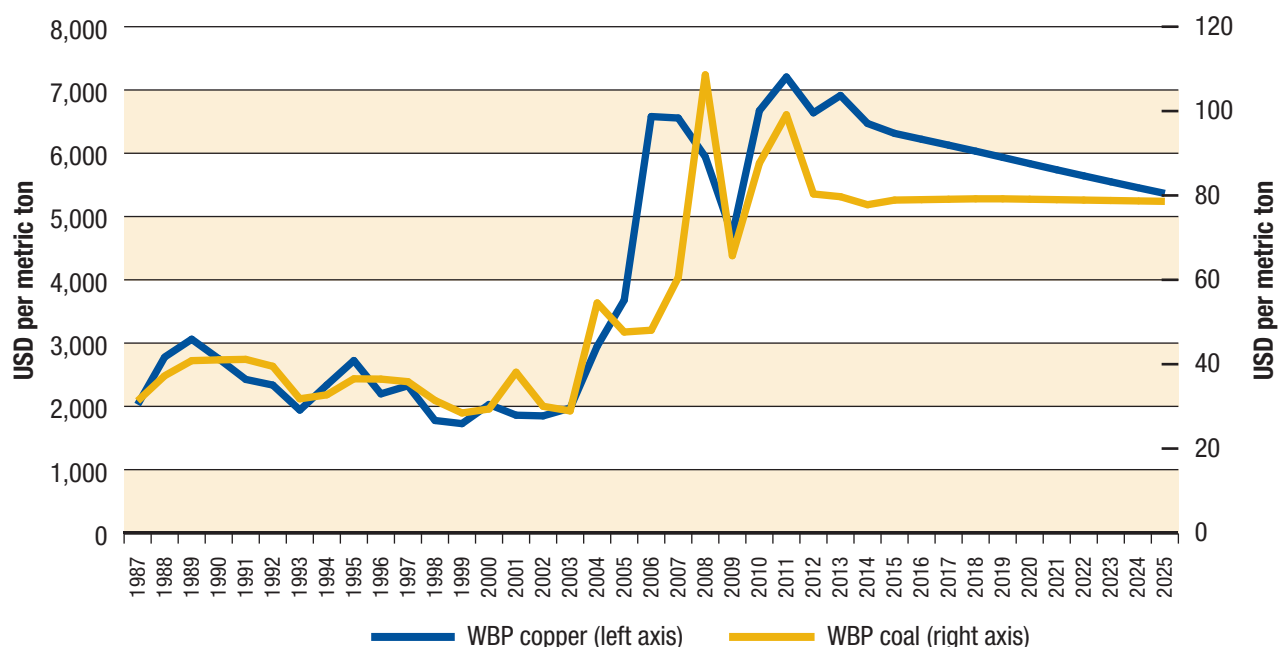
According to the World Bank report on global economic prospects, the Canadian economy experienced growth of 1.75 per cent in the first half of 2013. This growth was primarily driven by exports, a strong energy sector and an increase in overall consumption. The outlook for the Canadian economy remains cautiously optimistic over the long term. World Bank forecasts predict that the Canadian economy will expand by 2.25 per cent in 2014. Global GDP is expected to grow from 2.4 per cent in 2013 to 3.2 per cent in 2014. Moreover, the World Bank is projecting that global economic growth will stabilize to 3.5 per cent in 2016. Despite these positive indicators, continued fiscal uncertainty in the United States, the European debt crisis, slow growth in emerging economies, and the threat of stagnation or contraction in China is still generating fragile economic conditions. These risks will remain on the horizon and act as a drag on the global economy over the short-term. In Canada, weakened commodity prices will hinder growth in the minerals and metals sector; however, increased demand for metals, particularly in emerging markets, will eventually act as a growth catalyst for the Canadian mining industry.

COMMODITY PRICES

Early in the first quarter of 2013, economic outlooks seemed promising — resulting in an increase in industrial-based commodity prices. However, by the end of the first quarter, commodity prices had fallen to 2012 levels. Also during 2013, precious metals prices experienced a sharp decline, leading to uncertainty and slowed progress on several new projects in Canada.

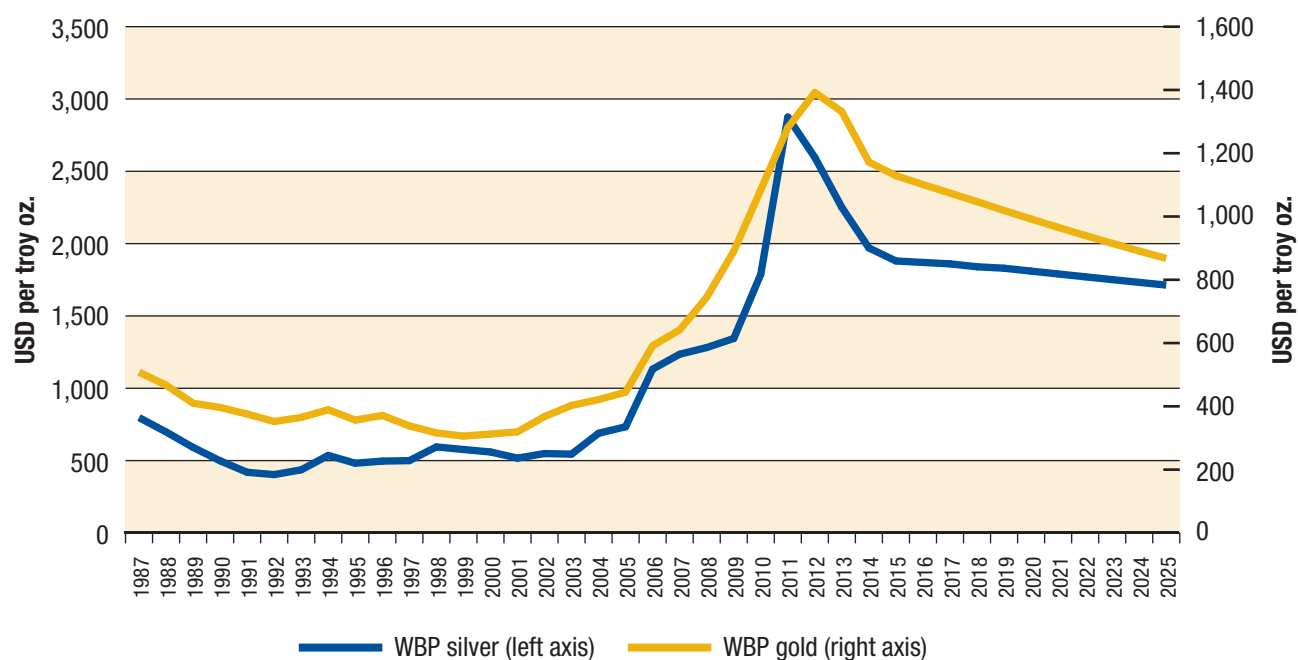
The volatility in price movements was mainly due to changing demand patterns. Stagnating economic growth in China translated into decreased Chinese demand for commodities, which in turn impacted global demand. In addition, fiscal uncertainty in the U.S. and slow growth in many emerging economies continued to exert downward pressure on commodity prices. That said, cyclical volatility in commodity prices is a normal characteristic of the market and although prices of metals have declined, they are still elevated by historical standards. Over the long-term forecast horizon, commodity prices are expected to stabilize.

Figure 1: Historical and Forecasted Price Movements of Coal and Copper



Source: Mining Industry Human Resources Council, 2014; World Bank, Development Prospectus Group, 2013

Figure 2: Historical and Forecasted Price of Gold and Silver

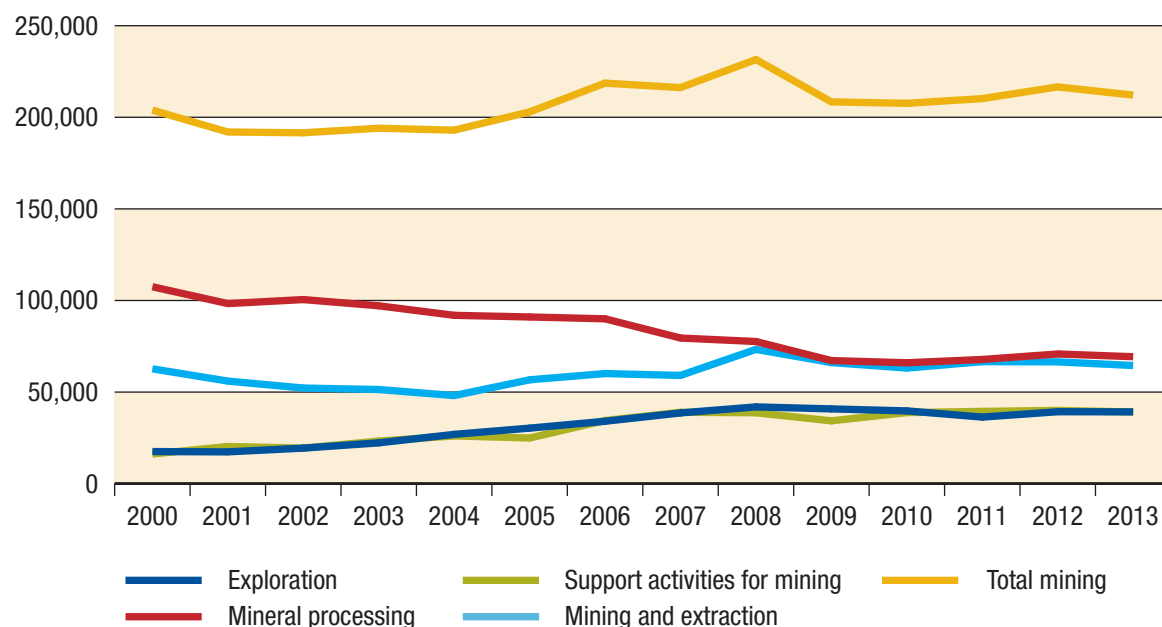


Source: Mining Industry Human Resources Council, 2014; World Bank, Development Prospectus Group, 2013

CANADA'S MINING LABOUR FORCE

According to MiHR estimates, the Canadian mining industry directly employed nearly 215,000 people in 2013 — down slightly from 2012. Figure 3 shows mining industry employment by sector over the period of 2000–2013. Thirty per cent of the total mining labour force was employed in mining extraction; 18 per cent in exploration; 18 per cent in mining support and supply services; and 33 per cent in mineral processing. Mineral exploration experienced a decline of nearly 30 per cent in total employment from 2012 to 2013. This decline highlights the impact on the labour market of tightening conditions in the capital markets and a decline in capital investment in exploration-related projects.

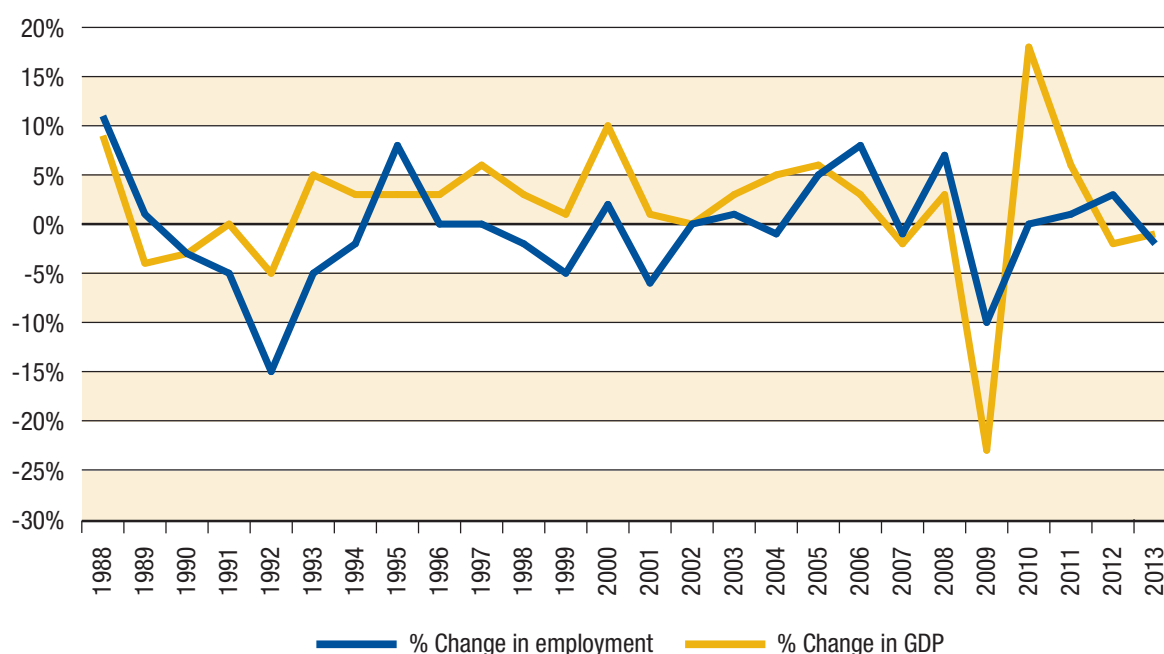
Figure 3: Employment in Canadian Mining, by Sector (2000–2013)



Source: Mining Industry Human Resource Council, 2014; Statistics Canada, 2013

MiHR research shows that employment in the industry is highly responsive to changes in economic activity. Figure 4 depicts the strong correlation between industry employment and mining's Gross Domestic Product (GDP). This relationship is an important driver in MiHR's employment forecasts.

Figure 4: Gross Domestic Product and Employment in Canada's Mining Industry (1987–2013)



Source: Mining Industry Human Resource Council, 2014; Statistics Canada, 2013

RETIREMENTS AND AGING

The mining industry employs a large proportion of older workers, particularly in occupations that have specialized, mining-specific skills and supervisory roles. In the coming decade, more baby boomers will enter their retirement years; as they leave the labour market, there will be an increased need to hire new workers to replace them. The industry will then be left to deal with the challenge of a less-experienced workforce, in addition to skills and labour shortages in key occupations and regions.

Figure 5 shows that the wave of retirements is already affecting the industry and the demographics are slowly shifting. Recent data from Statistics Canada's 2011 National Household Survey shows that 13 per cent of the Canadian labour force is over the age of 55 — an age structure that is reflected in the mining workforce. Also in line with the overall labour force, 43 per cent of the mining labour force is over the age of 45. MiHR projects that the retirement rate in Canada's mining industry will rise from about 2.5 per cent in 2013 to 3 per cent in 2024 — an increase of roughly 20 per cent.

Figure 5: Age Group Distribution in Canadian Mining, 2013

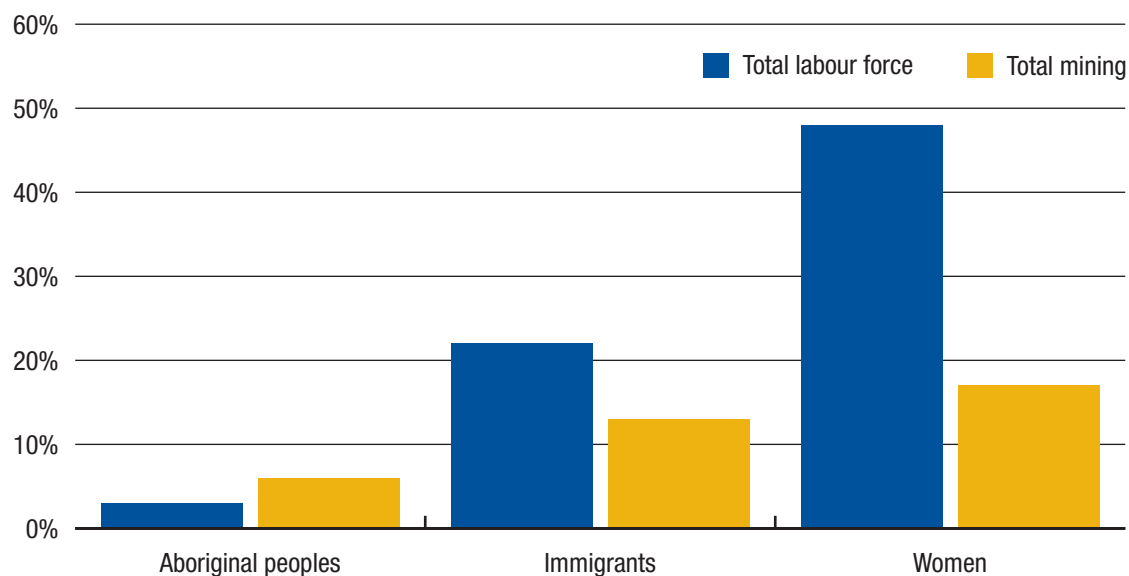


Source: Mining Industry Human Resources Council, 2014; Statistics Canada, 2014

DIVERSITY: A PROFILE OF IMMIGRANTS, WOMEN AND ABORIGINAL PEOPLES

The future strength of Canada's mining labour force will depend on the participation of diverse groups, such as Aboriginal peoples, women and immigrants. These groups have historically been under-represented and under-utilized in mining, compared to other industries. As Figure 6 indicates, women represent 17 per cent of the mining labour force, while making up nearly half of the total Canadian labour force. Twenty-two per cent of the total Canadian labour force consists of immigrants; however, immigrants make up only 13 per cent of the mining workforce. The proportion of Aboriginal peoples is higher in mining (6 per cent) than for the total labour force (3 per cent).

Figure 6: Participation of Aboriginal Peoples, Immigrants and Women



Source: Mining Industry Human Resource Council, 2014; Statistics Canada, 2011 National Household Survey

3 NATIONAL FORECASTS OF EMPLOYMENT AND HIRING REQUIREMENTS



MiHR's employment and hiring requirements model forecasts the hiring needs of the industry over a 10-year horizon under three economic scenarios — expansionary, baseline and contractionary. Forecasts under a baseline scenario are then broken down by industry sector and by occupation.

HIRING REQUIREMENTS FORECAST

MiHR's employment and hiring requirements forecasts are based on an economic model that combines a number of factors, including productivity, changes in commodity prices, demand for minerals and metal products, and other key economic and demographic indicators — such as retirement rates, workforce mobility and churn, and separation rates. Moreover, different commodity mixes and regional contexts add other layers of complexity, which are also considered in our forecasts. Data from Statistics Canada, the World Bank, Natural Resources Canada and MiHR's annual Labour Market Information (LMI) survey of industry are key inputs in the model. Hiring requirements projected in this report represent direct employment in the mining industry. Indirect or secondary employment due to mining activities is not included in this report.

MiHR's hiring requirement forecasts combine net change in employment due to industry growth with replacement requirements from retirement and other separations.

NET CHANGE IN EMPLOYMENT

Total employment in the mining industry is expected to register modest gains or remain stable over the forecast period, depending on the scenario. Projected changes are fuelled by economic uncertainty in the early part of the forecast and gains in labour productivity in later years.

RETIREMENT RATES

The decision to retire is a complex process dependent on many different socio-economic variables and personal behaviours. MiHR's retirement model uses demographics and participation rates for various age groups, as well as levels of educational attainment, to predict general retirement rates.

OTHER SEPARATIONS

Attrition from the labour pool can stem from various circumstances. In MiHR's model, the category of "other separations" captures permanent leaves of absence that are not related to retirement, such as movement to other sectors or other countries, and injury/mortality. The model assumes a constant non-retirement separation rate of 2 per cent each year.

CUMULATIVE HIRING REQUIREMENTS FORECASTS

Table 1 shows the total cumulative hiring requirements to 2024. In a baseline scenario, the mining industry will need to hire more than 120,000 workers. In an expansionary scenario, this need grows to more than 135,000 workers and in a contractionary scenario, MiHR forecasts the need to hire nearly 100,000 workers.

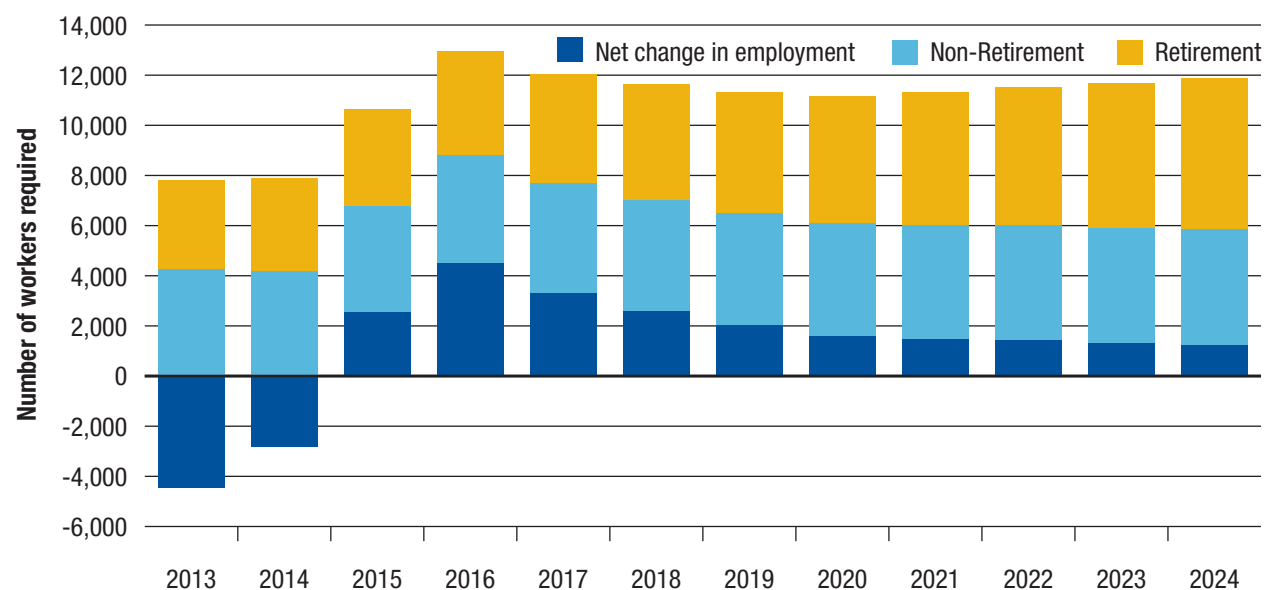
Table 1: Cumulative Hiring Requirements Forecasts, by Scenario — to 2024

	NET CHANGE IN EMPLOYMENT	REPLACEMENT REQUIREMENTS		CUMULATIVE HIRING REQUIREMENTS
		RETIREMENT	NON-RETIREMENT SEPARATION	
Contractionary	2,980	50,730	46,000	99,685
Baseline	19,130	53,100	48,930	121,150
Expansionary	29,973	55,170	50,800	135,910

Source: Mining Industry Human Resources Council, 2014

Figure 7 illustrates the annual hiring requirements over the forecast period. The bulk of the hiring requirements stems from the need to replace workers retiring or leaving the industry for other reasons.

Figure 7: Annual Hiring Requirements Forecast, Baseline Scenario (2013–2024)



Source: Mining Industry Human Resource Council, 2014

Table 2 summarizes the cumulative hiring requirements over 2, 5 and 10 years — under contractionary, baseline and expansionary scenarios. In the short-term, the baseline scenario projects the need to hire more than 28,000 workers by 2016. If economic conditions are better than expected, the total cumulative hiring requirements could grow to over 36,000 workers by 2016.

Table 2: Cumulative Hiring Requirements Forecasts, by Scenario — 2016, 2019, 2024

	CUMULATIVE HIRING REQUIREMENTS		
	2016	2019	2024
Contractionary	15,470	46,980	99,690
Baseline	28,620	63,620	121,150
Expansionary	36,570	73,930	135,910

Source: Mining Industry Human Resources Council, 2014

FORECAST BY OCCUPATION

The occupational breakdown of the baseline hiring-requirements forecasts includes 66 different mining occupations, as defined by Statistics Canada's National Occupational Classification for Statistics (NOC-S) Codes. NOC-S Codes seek to classify individuals doing similar kinds of work into the same job categories. However, there are some constraints imposed by the NOC-S categories. The occupation forecasts included in the report represent about 60 per cent of the mining industry workforce. More discussion on the occupation classifications used in MiHR's forecasts can be found in Appendix C.

Table 3 provides estimates of cumulative hiring requirements for the baseline scenario by broad occupational category. The top 10 occupations with the greatest forecasted hiring requirements include:

- Underground production and development miners
- Heavy equipment operators (except crane)
- Construction millwrights and industrial mechanics (except textile)
- Truck drivers
- Welders and related machine operators
- Primary production managers (except agriculture)
- Machine operators, mineral and metal processing
- Heavy-duty equipment mechanics
- Industrial electricians
- Supervisors, mining and quarrying

Table 3: Hiring Requirements Forecasts by Broad Occupational Categories, Baseline Scenario — to 2024

	2016	2019	2024
Trades and Production Occupations	8,615	19,140	36,465
Professional and Physical Science Occupations	1,500	3,350	6,380
Human Resources and Financial Occupations	730	1,630	3,100
Support Workers	760	1,675	3,205
Technical Occupations	820	1,820	3,470
Supervisors, Coordinators and Foremen	1,555	3,470	6,600
All Other Occupations	14,640	32,535	61,930
Total	28,620	63,620	121,150

Source: Mining Industry Human Resources Council, 2014

A listing of the cumulative hiring requirements forecasted for each of the 66 occupations over a 10-year horizon can be found in Chapter 5, Table 6.

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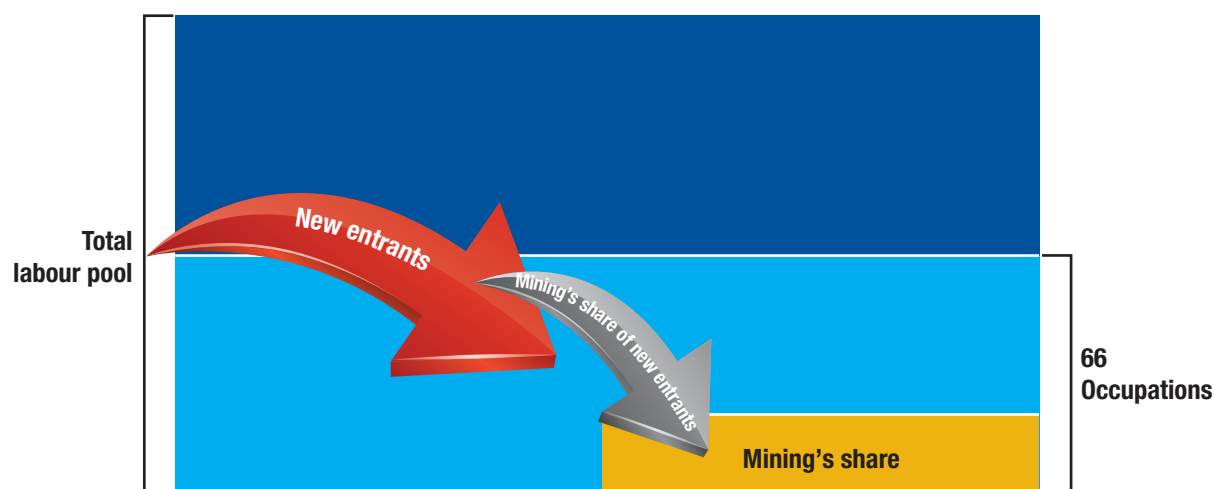
AVAILABLE TALENT



MiHR's model of available talent is based on the 66 specific occupations identified as critical to the mining industry. For each occupation, the model estimates the total pool (supply) of workers available to all industries and then determines the portion that will enter the mining industry. The model considers new labour market entrants from a variety of sources, including immigration (international and interprovincial), education flows and other entry points. A full description of this model can be found in Appendix B.

As illustrated in Figure 8, not all individuals entering a particular occupation (e.g., steamfitters) will work in mining. For key mining occupations, MiHR first estimates the number of new entrants that will be available in the labour pool for all industries (the large red arrow) and then calculates mining's share of these entrants (the small grey arrow), based on historic trends. This number then represents the projected available talent for each occupation.

Figure 8: MiHR's Model of Available Talent for Mining



Source: Mining Industry Human Resources Council 2014

CUMULATIVE TOTAL AVAILABLE TALENT

Table 4 shows the cumulative available talent for all 66 occupations over a 2-, 5- and 10-year time horizon. The forecast shows that there will be approximately 1,264,000 new entrants into the Canadian labour force for the selected 66 occupations (listed in Table 6 and also in Appendix C) over the next 10 years. Of these new entrants, the mining industry can expect to attract slightly more than 58,000 workers — assuming the sector's historical share remains consistent moving forward.

Table 4: Cumulative Available Talent, All Sectors and Mining, 66 Occupations — 2016, 2019, 2024

CUMULATIVE AVAILABLE TALENT	2016	2019	2024
Total entrants for 66 occupations, all industry sectors	256,180	637,725	1,264,330
Mining's share of entrants for 66 occupations (assuming the historical rate for each occupation per year)	11,035	28,595	58,210

Source: Mining Industry Human Resources Council, 2014

AVAILABLE TALENT BY OCCUPATION

Table 5 shows mining's share of the cumulative available talent over the next 10 years, by broad occupational category. The table also shows the total available talent for the occupational categories in all sectors, along with the proportion (per cent) that the mining industry has historically attracted from each category.

Table 5: Cumulative Available Talent by Broad Occupational Categories, 66 Occupations — to 2024

	MINING'S SHARE OF AVAILABLE TALENT (NUMBER OF WORKERS)	TOTAL AVAILABLE TALENT, ALL SECTORS (NUMBER OF WORKERS)	MINING'S HISTORIC SHARE OF AVAILABLE TALENT (PER CENT)
Trades and Production Occupations	36,040	531,180	7%
Professional and Physical Science Occupations	6,610	143,760	5%
Human Resources and Financial Occupations	2,380	191,720	1%
Support Workers	3,180	250,780	1%
Technical Occupations	4,130	98,120	4%
Supervisors, Coordinators, and Foremen	5,840	48,770	12%

Source: Mining Industry Human Resources Council, 2014

A detailed list and the associated cumulative share of available talent for each of the 66 occupations can be found in Chapter 5, Table 6.

5 THE TALENT GAP



MiHR's gap analysis provides a side-by-side comparison of the hiring requirements and the available talent forecast for the selected 66 occupations discussed in Chapters 3 and 4. The nature of the talent gaps varies among occupations — three patterns emerge. In some cases, the existing pool of talent available to the industry is sufficient to meet projected hiring needs; in other cases, the pool of talent falls short of industry's needs, but talent is available in other sectors; and in the third case, there won't be enough new talent to meet projected needs.

THE CANADIAN MINING TALENT GAP

Table 6 presents an occupational breakdown of hiring requirements and available talent. All numbers represent cumulative counts over a 10-year horizon to 2024. Cumulative hiring requirements (from Chapter 3) represent the sum of changes in employment, retirement and non-retirement exits. Available talent (from Chapter 4) is calculated as the share that mining historically attracts from the talent pool for each occupation. Cumulative hiring requirements are subtracted from mining's available talent to estimate the looming talent gap.

The column titled "The Challenge" shows the available talent pool for all industry sectors and mining's historic share of the labour pool for each occupation.

Table 6: Cumulative Occupational Breakdown of Hiring Needs and Available Talent — to 2024

	THE NEED	AVAILABLE TALENT AND GAP		THE CHALLENGE	
	CUMULATIVE HIRING REQUIREMENTS	AVAILABLE TALENT — MINING'S SHARE	GAP	TOTAL AVAILABLE TALENT — ALL INDUSTRIES	MINING'S SHARE
TRADES AND PRODUCTION OCCUPATIONS					
Underground production and development miners	5,750	4,010	-1,740	4,420	90.7%
Heavy equipment operators (except crane)	4,640	4,450	-190	29,390	15.4%
Construction millwrights and industrial mechanics (except textile)	3,905	3,600	-305	26,760	13.4%
Truck drivers	3,715	4,070	355	119,840	3.4%
Welders and related machine operators	2,525	2,750	225	48,050	5.7%
Machine operators, mineral and metal processing	2,180	1,780	-400	3,080	57.9%
Heavy-duty equipment mechanics	2,040	2,410	370	16,390	14.7%
Industrial electricians	1,990	1,670	-320	10,940	15.3%
Workers in mineral and metal processing	1,590	2,410	820	5,560	43.4%
Mine workers	1,370	1,050	-320	1,250	83.9%
Material handlers	1,235	1,570	335	80,820	1.9%
Crane operators	985	990	5	4,840	20.4%
Construction trades helpers and workers	955	1,180	225	75,250	1.6%
Steamfitters, pipefitters and sprinkler system installers	875	970	95	9,600	10.1%
Underground mine service and support workers	850	1,040	190	1,240	83.8%
Central control and process operators, mineral and metal processing	805	1,020	215	1,470	69.3%
Drillers and blasters — Surface mining, quarrying and construction	495	450	-45	1,340	33.8%
Other trades helpers and workers	265	140	-125	4,220	3.2%
Carpenters	210	310	100	66,410	0.5%
Plumbers	85	170	85	20,310	0.9%
Total	36,465	36,040	-425	531,180	7%
PROFESSIONAL AND PHYSICAL SCIENCE OCCUPATIONS					
Geologists, geochemists and geophysicists	1,545	1,930	385	8,320	23.2%
Mining engineers	985	1,370	385	2,470	55.3%
Mechanical engineers	805	620	-185	26,360	2.3%
Electrical and electronics engineers	570	340	-230	22,270	1.5%
Chemical engineers	455	400	-55	7,980	5.0%
Industrial and manufacturing engineers	425	700	275	13,840	5.1%
Chemists	305	270	-35	14,670	1.8%
Metallurgical and materials engineers	270	410	140	1,670	24.3%
Other professional engineers, n.e.c.	260	20	-240	2,030	0.8%

	THE NEED	AVAILABLE TALENT AND GAP		THE CHALLENGE	
	CUMULATIVE HIRING REQUIREMENTS	AVAILABLE TALENT — MINING'S SHARE	GAP	TOTAL AVAILABLE TALENT — ALL INDUSTRIES	MINING'S SHARE
Other professional occupations in physical sciences	210	240	30	770	30.6%
Geological engineers	195	110	-85	1,550	7.0%
Biologists and related scientists	190	50	-140	14,570	0.4%
Civil engineers	165	150	-15	27,260	0.6%
Total	6,380	6,610	230	143,760	5%

HUMAN RESOURCES AND FINANCIAL OCCUPATIONS

Financial auditors and accountants	1,355	1,200	-155	93,770	1.3%
Human resources managers	635	320	-315	16,680	1.9%
Financial managers	535	320	-215	28,050	1.1%
Specialists in human resources	430	360	-70	24,410	1.5%
Financial and investment analysts	145	180	35	28,810	0.6%
Total	3,100	2,380	-720	191,720	1%

SUPPORT WORKERS

Secretaries (except legal and medical)	820	860	40	72,300	1.2%
Inspectors in public and environmental health and occupational health and safety	800	550	-250	8,860	6.2%
Inspectors and testers, mineral and metal processing	360	510	150	1,670	30.9%
Production clerks	320	340	20	10,880	3.1%
Dispatchers and radio operators	275	330	55	12,900	2.6%
Cooks	225	160	-65	84,720	0.2%
Administrative clerks	205	340	135	48,770	0.7%
Construction estimators	110	30	-80	6,760	0.5%
Engineering inspectors and regulatory officers	85	30	-55	1,620	2.1%
Transportation route and crew schedulers	5	30	25	2,300	1.5%
Total	3,205	3,180	-25	250,780	1%

TECHNICAL OCCUPATIONS

Land surveyors	625	230	-395	5,210	4.4%
Mechanical engineering technologists and technicians	485	280	-205	6,240	4.6%
Geological and mineral technologists and technicians	370	1,460	1,090	4,920	29.6%
Chemical technologists and technicians	360	810	450	18,220	4.4%
Civil engineering technologists and technicians	320	30	-290	5,620	0.6%

	THE NEED	AVAILABLE TALENT AND GAP		THE CHALLENGE	
	CUMULATIVE HIRING REQUIREMENTS	AVAILABLE TALENT — MINING'S SHARE	GAP	TOTAL AVAILABLE TALENT — ALL INDUSTRIES	MINING'S SHARE
Drafting technologists and technicians	295	340	45	20,200	1.7%
Electrical and electronics engineering technologists and technicians	295	470	175	14,980	3.1%
Mapping and related technologists and technicians	260	60	-200	5,390	1.1%
Land survey technologists and technicians	255	50	-205	1,710	2.9%
Industrial engineering and manufacturing technologists and technicians	125	360	235	9,310	3.8%
Biological technologists and technicians	80	40	-40	6,320	0.6%
Total	3,470	4,130	660	98,120	4%
SUPERVISORS, COORDINATORS, AND FOREMEN					
Primary production managers (except agriculture)	2,235	2,680	445	6,140	43.8%
Supervisors, mining and quarrying	1,825	1,450	-375	1,620	89.2%
Supervisors, mineral and metal processing	1,230	970	-260	2,260	42.8%
Engineering managers	515	210	-305	8,420	2.5%
Construction managers	510	140	-370	22,050	0.7%
Contractors and supervisors, mechanic trades	240	280	40	6,520	4.3%
Contractors and supervisors, pipefitting trades	45	110	65	1,760	6.0%
Total	6,600	5,840	-760	48,770	12%

Source: Mining Industry Human Resources Council, 2014

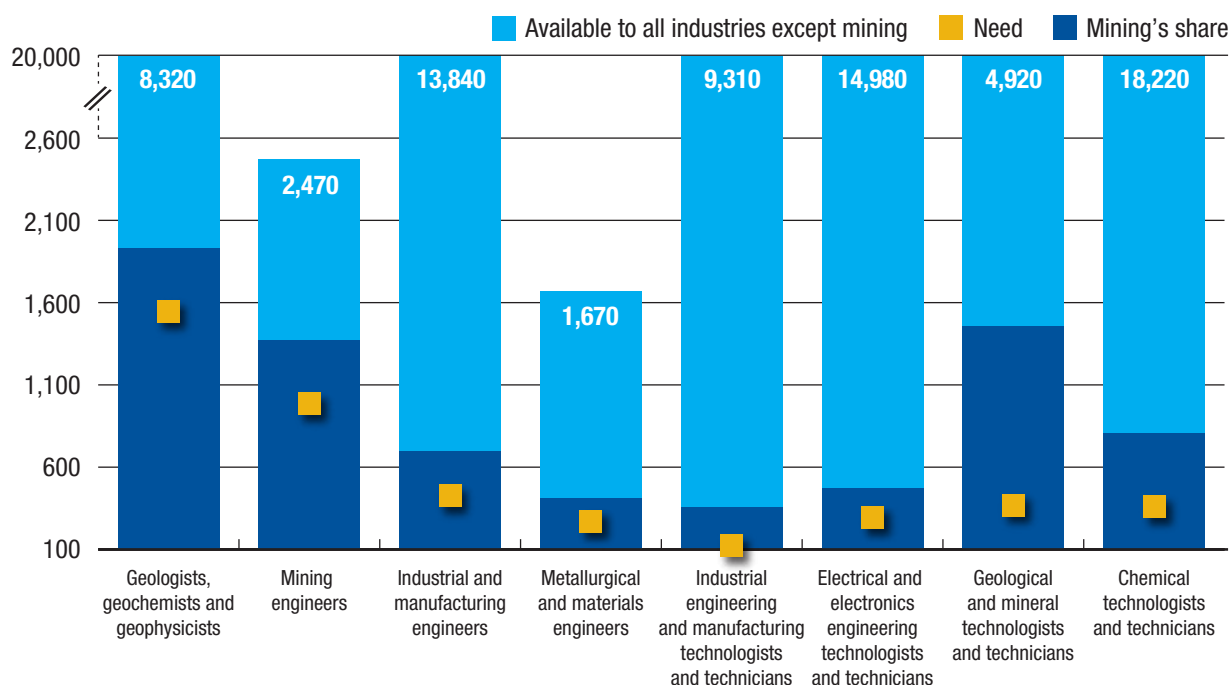
GAP ANALYSIS

The gap analysis reveals a pattern in which occupations group into three types of gaps/trends, characterized as:

- Retain and develop — available talent is sufficient to meet hiring requirements. Efforts should focus on retention and development of the current workforce to ensure that no unexpected gaps emerge.
- Compete for talent — mining's share of available talent is insufficient to meet hiring requirements but talent is available in other sectors. Efforts should focus on coordinated, industry-level strategies and initiatives to attract new talent to careers in mining.
- Grow the talent pool — available talent is insufficient to meet hiring requirements and there is no talent available in other sectors. For these occupations, efforts should focus on increasing the number of new entrants to occupations overall, through such options as immigration, education and training.

RETAIN AND DEVELOP

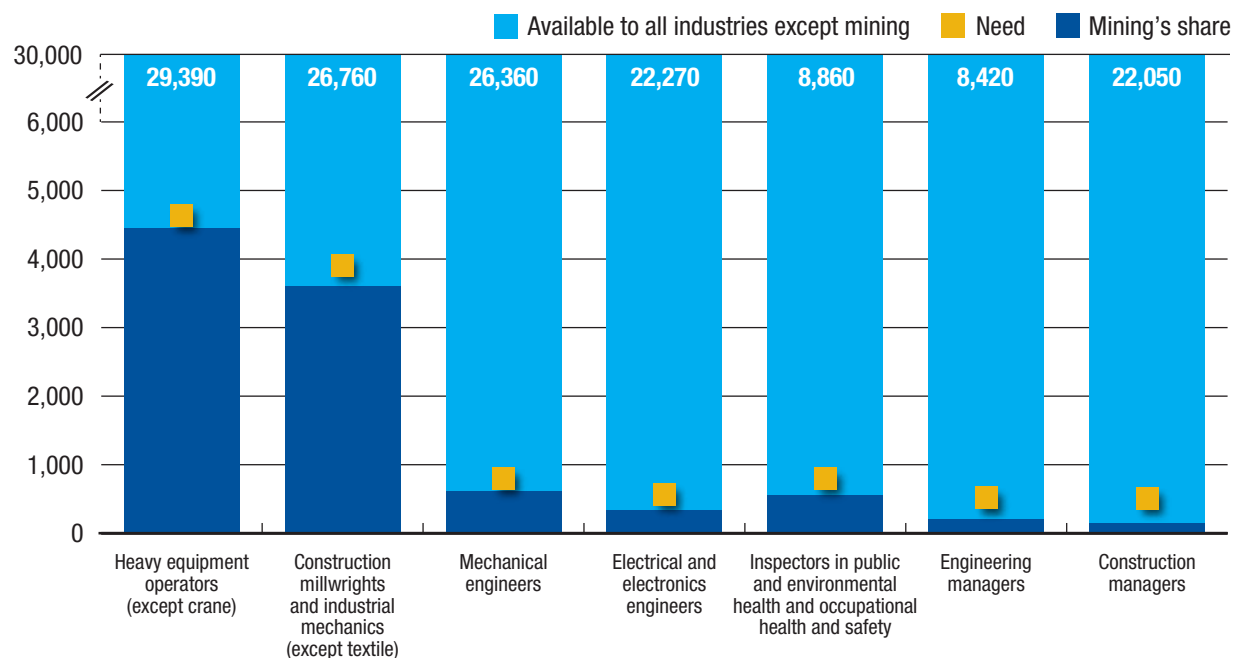
Figure 9: Focus on Retention and Development, Projected Gaps — to 2024



Source: Mining Industry Human Resources Council, 2014

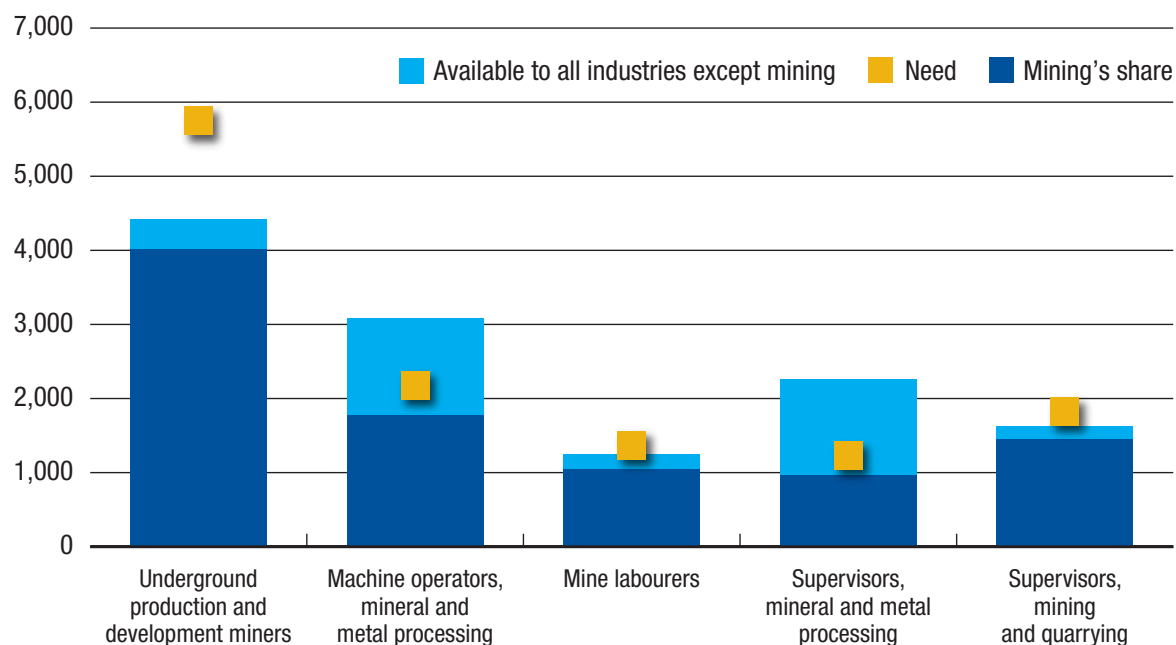
COMPETE FOR TALENT

Figure 10: Focus on Competing for Talent, Projected Gaps — to 2024



Source: Mining Industry Human Resources Council, 2014

Figure 11: Focus on Growing the Talent Pool, Projected Gaps — to 2024



Source: Mining Industry Human Resources Council, 2014

MINING LABOUR MARKET TRENDS AND RECOMMENDATIONS

In 2013 the mining industry has undergone a slow transition. Sluggish demand for commodities, declining prices of precious metals and cautious investment sentiment have forced mining employers to implement cost-cutting measures in the short-term. However, the forecast and gap analysis presented in this report shows that despite the recent contraction in the mining industry, the industry is still facing various HR challenges. An integrated and strategic approach will be required in the long term to build a skilled and sustainable mining labour force.

- In the coming years, the mining industry will lose a considerable proportion of its experienced workforce due to retirements. This attrition will also result in a loss of knowledge and experience. At the same time, there is a lack of young workers entering the industry. The mining industry needs to devise long-term strategies related to succession planning and retention of corporate knowledge. These strategies will be vital in developing a sustainable workforce.
- Retirements will also affect leadership positions, creating a void in supervisory and managerial occupations. Developing mentorship programs will be essential to ensure a steady supply of future managers and leaders. Leadership development and training programs, succession planning, identifying and grooming high-potential employees for managerial and supervisory roles and incorporating leadership development in early career stages are possible initiatives to address this need.

- “Trades and production” occupations continue to make up a large proportion of the mining industry’s hiring requirements, with significant pressure to replace retiring workers. This category includes high-demand occupations where mining must compete against other sectors for talent (e.g., haul truck drivers, heavy equipment operators). It also includes a number of occupations where there are simply not enough new entrants to meet projected needs in the next 10 years (e.g., underground production and development miners, supervisors in mining and minerals processing). Systematic analysis of the skills and competencies required to perform these important jobs and development of National Occupational Standards can provide clarity about the important skills sets that will be lost through retirement attrition. National Occupational Standards provide a foundation for effective succession planning in high-demand jobs — helping to align training programs and target resources toward developing skills that support career progression. Certification and recognition of some of the key production jobs, especially miners and minerals processing operators, will help mining to attract new workers and retain existing workers to ensure this gap doesn’t widen.
- The mining sector will need to invest more effort in attracting new entrants, especially in occupations for which the gap between available talent and hiring requirements is large. Currently, there is a mismatch between industry’s needs and the skills profiles of job-seekers. Furthermore, job-seekers — whether youth, unemployed, immigrants or Aboriginal peoples — lack access to up-to-date information about the job prospects and career progression opportunities in the industry. Key strategies in this regard include the following: ensuring that those who are looking for work are able to access information about the high-demand occupations in the mining industry; providing information about the knowledge and training required to get hired; and informing potential employees about the paths of career progression, as they build their skills and competencies. Over the next two and a half years, MiHR will work to create Labour Market Information that is “job-seeker-friendly” — and will develop new ways of disseminating the outcomes of the mining industry forecasting model to job-seekers.
- Labour market pressures often force employers to seek out other talent pools. Immigration is a significant source of workers for the Canadian economy. In the coming years, mining employers will need to focus on attracting more immigrants to work in the industry. Further research is required to identify key barriers to entry for skilled immigrants and to provide targeted training solutions to ensure that they are able to work in the Canadian mining context. It will be important for industry to understand what challenges exist, and to develop strategies and tools that allow for a smoother transition of immigrants into the Canadian mining workforce. Examples of such programs might include developing strategies for attracting immigrants to work in remote communities or creating tools to recognize the transferable skills of internationally trained and experienced workers. In the next few years, MiHR will be working with industry stakeholders on a national study of immigrants and the Canadian mining industry workforce. This study will provide research on the main barriers to fuller participation of immigrants in mining, and will propose tools and programs to address the needs of this target group.
- Women make up 48 per cent of the Canadian labour market and yet, only 17 per cent of the workforce in mining is female. The industry will need to continue efforts to engage this important category of potential workers to meet future talent needs. In particular, removing barriers and encouraging women’s participation in all occupations — from trades and production jobs through to leadership positions — will address both labour shortages and leadership challenges. Current research shows that women are primarily employed in clerical and corporate services roles, with participation at less than 5 per cent in most trades and production roles. MiHR’s research over the next three years will expand our understanding of the constraints and opportunities related to increased participation of women in all occupational groups in mining.

- Aboriginal peoples are the youngest and fastest-growing segment of the Canadian population and the mining industry is a major employer of First Nations, Inuit and Métis people. Corporate social responsibility, community engagement, environmental stewardship and community partnerships will continue to be primary objectives for mining sector employers — each of which has a direct impact on the industry's ability to attract and engage this important segment of the labour market. Workplace readiness, essential skills development and mining-specific education — as offered through MiHR's *Mining Essentials* training program — continue to bolster the mining industry's goal of supporting Aboriginal peoples to pursue careers in the industry.
- Despite being a major employer of Aboriginal peoples, the mining industry still tends to under-utilize this talent group. Anecdotal evidence suggests that Aboriginal employees are mainly found in entry-level and support roles. MiHR is currently in the planning phases for a comprehensive study that will examine the barriers and constraints to Aboriginal participation in the mining workforce, as well as issues related to career progression. This research will highlight the need for more focused strategies to help the mining industry to more fully engage with this important talent group.
- Fostering partnerships between industry and educational institutions is important, particularly given the projected gaps between the need for skilled and educated workers, and the supply of available talent. It can take many years to initiate or change education and training programs, and then additional years to graduate a cohort of students to fill vacant positions. MiHR continues to work on enhancing the ability of the mining industry to communicate with governments and educational institutions on present and anticipated future needs in terms of workforce skills and knowledge.

APPENDIX A

HIRING REQUIREMENTS FORECAST METHODOLOGY

This appendix outlines the methodology used by MiHR to produce forecasts of hiring requirements in the mining industry. It also describes the various data that were required, along with the development of the forecasting models.

Forecasting models of employment were estimated based on the following six steps:

- **Step 1:** Collect and analyze data that may potentially explain changes in the number of jobs in each region.
- **Step 2:** Determine the driver(s) that explain the greatest level of variation in the number of jobs in each region by testing various model specifications through regression analysis.
- **Step 3:** Produce baseline, contractionary and expansionary forecasts for employment over a 10-year horizon.
- **Step 4:** Produce forecasts of retirement separations based on age profile, level of education, and participation rates.
- **Step 5:** Combine forecasts of employment change, retirement and other separations to produce hiring requirements forecasts.
- **Step 6:** Calculate and apply occupational coefficients to produce estimates of hiring requirements by occupation.

Several indicators were considered as explanatory variables for predicting employment. Rigorous modelling showed that economic indicators predicting change in GDP (e.g., commodity prices, labour productivity, capital stock, downstream production and sales, etc.), were the best predictors of employment in mining. There is a strong positive relationship between mining GDP and employment. Expansionary scenarios assume better than predicted, and contractionary scenarios assume worse than predicted changes in GDP indicators.

MiHR regularly validates forecasts and collects primary inputs through surveys of industry employers on the size and age profile of their workforces, diversity and demographic characteristics, occupational profiles, expected hiring needs, and the turnover and separation patterns they observe. Survey findings are used to validate forecasts and augment the assumptions for the forecast scenarios.

MiHR's hiring-requirements forecasting model combines the effects of various economic indicators (e.g., changes in commodity prices, productivity, downstream output sales) on employment, retirement rates and non-retirement separation rates, to produce estimates of hiring requirements.

APPENDIX B

AVAILABLE TALENT MODEL INPUTS AND ASSUMPTIONS

Model inputs come from a combination of sources. Due to the level of detail required for these analyses, it was necessary to use census data. In 2010, Statistics Canada replaced the mandatory long-form census questionnaire with the new voluntary National Household Survey. For the current analysis, data was used from the 2011 National Household Survey — the most current detailed source of employment data available from Statistics Canada. It provides the simultaneous breakdown of employment by industry, region, occupation and other required demographic detail. The major weakness of the National Household Survey data is that it is compiled only once every five years. Where possible, more recent data (e.g., from the Labour Force Survey) is incorporated into the forecast, to verify and validate the estimates.

EMPLOYMENT BY OCCUPATION

MiHR generates estimates of employment, retirements and “other” exits by occupation, as part of its hiring requirements forecasts. Employment outlooks for each occupation in mining were tied to MiHR’s employment forecasts. Employment estimates for each occupation in other industry sectors were tied to The Conference Board of Canada’s forecasts for non-mining sectors.

Employment by occupation is used to help estimate migration patterns in the model. Employment for each occupation is divided into two categories: the mining industry and other industries. The census data (from the National Household Survey for this report) provides information on the starting points of these two series. The mining portion of employment is taken from MiHR’s mining employment forecasts and employment for all other sectors is taken from The Conference Board of Canada’s employment forecasts. These results are then added together to generate total employment by occupation.

The underlying assumption behind this methodology is that occupational employment in the mining sector will grow at the same pace as the entire mining industry, and that occupational employment outside of the mining sector will grow at the same pace as the rest of the economy. This is a reasonable assumption, as it implies that the share each occupation occupies — both within the mining sector and within the rest of the economy — will remain constant.

MIGRATION

Net international migration forecasts are based on estimates of net international migration for Canada by occupation, taken from Human Resources and Skills Development Canada’s (HRSDC’s) Canadian Occupational Projection System (COPS) model.

Net interprovincial migration is based on the balance of supply and demand of workers in a particular occupation. This assumes that a surplus of workers (a “soft labour market”) leads to net outward migration, while a lack of workers (a “tight labour market”) leads to a net inflow of workers in a given province. According to modelling done by The Conference Board of Canada, the unemployment rate in a region is an important determinant of migration flows, and the gap between supply and demand is a proxy for the unemployment rate for each occupation.

The forecasts of employment by occupation are used to generate net migration estimates for each occupation. Interprovincial and international immigration by occupation is known from the 2006 Census of Canada. To forecast immigration, the share of immigrants by occupation, relative to total immigration, is kept constant over the forecast period and applied to The Conference Board of Canada’s provincial forecast for immigration by province. This is done for both interprovincial and international immigration.

This methodology incorporates the relative mobility of each occupation into the forecast. Occupations where people have historically been less likely to move will continue to display this characteristic and those with historically higher levels of mobility will continue to behave in a similar manner. As well, by tying the forecast to The Conference Board of Canada's existing forecasts for provincial immigration, this methodology incorporates a measure of the attractiveness of a region. The Conference Board of Canada's forecasts are dependent on the relative tightness of a region's labour markets and its historic ability to attract migrants.

SCHOOL LEAVERS

The forecast of school leavers is generated using two methods. The first method is based on the occupation's historic ability to attract people leaving school; if a certain share of the population under the age of 25 has historically entered a particular occupation, it is assumed that the share of entrants will remain similar going forward. Thus, the number of new entrants depends on the age profile of the workforce. School graduation figures and forecasts for specific occupations are also considered.

Second, to estimate the number of school leavers by occupation, the educational attainment of workers aged 25 to 34 is used to establish the education profile for each occupation. The 2006 census provides the most recent data on the number of workers by age group, occupation, and highest certificate, diploma or degree obtained. This information is combined with demographic data to estimate the number of school leavers per occupation. An estimate of how attractive a particular occupation is to school leavers is also applied for each occupation. Finally, estimates of how many school leavers will enter the workforce every year are created. School-leaver estimates are calculated for three broad levels of education: high school diploma or lower; trade, college or other post-secondary education below the bachelor's degree level; and university degree.

RETIREMENTS

Retirement leavers are estimated using MiHR's forecasted retirement rates by province, which combine labour force participation rates by age and level of education, and forecast separations starting with the 2011 National Household Survey profile age of the industry.

OTHER ENTRANTS

The last group of new entrants is the "other entrants" category, which largely consists of new people entering from other occupations or re-entering the workforce. Given the degree of training required for many of these occupations, it is very likely that these entrants would already be trained in that occupation. For simplicity, the number of new entrants is assumed to be a certain percentage of the existing labour force. This rate is set equal to the "other leavers" rate that MiHR uses as part of its existing models and is constant across occupations. In this manner, "other entrants" are precisely equal to and offset "other leavers".

OTHER LEAVERS

"Other leavers" include people moving to other occupations, people temporarily leaving the workforce, and people dying. The leavers' rate is sourced from MiHR's existing models. The model then assumes equilibrium in "other" labour mobility, thus the model matches "other leavers" with "other entrants".

APPENDIX C

This Appendix lists the North American Industry Classification Codes (NAICS) and National Occupational Classification for Statistics (NOC-S) codes used throughout this report to define the mining industry. MiHR is engaged in ongoing, iterative research to include more NOC-S codes in this definition of the sector and to better capture Statistics Canada data related to the mining industry workforce.

INDUSTRY DEFINITION AND SCOPE

Statistics Canada, the main source of Canada's labour market information, uses two different coding systems to classify data: the North American Industry Classification System (NAICS) and the National Occupational Classification for Statistics (NOC-S). Both systems provide a hierarchical structure that divides higher-level categories into more detailed categories in order to group similar establishments and individuals.

NAICS codes are used by statistical agencies throughout North America to describe economic and business activity at the industry level. The system features a production-oriented framework where assignment to a specific industry is based on primary activity, enabling it to group together establishments with similar activities.

The NOC-S system was developed by Statistics Canada and Human Resources and Skills Development Canada (HRSDC) to provide standardized descriptions of the work that Canadians perform in the labour market. NOC-S codes organize labour-force participants according to the nature of work they perform, thereby enabling similar occupations to be grouped. NOC-S codes are specific to Canada.

There is no single NAICS code that directly corresponds to all phases of the mining cycle (which includes exploration, development, extraction, processing and reclamation). Similarly, there is no single set of NOC-S categories that pertain to only mining. People employed in occupation groups that are prevalent in mining also work in a variety of other industries. Together, the NAICS and NOC-S systems provide a means for grouping statistics to obtain estimates of employment and workforce demographics using Statistics Canada data sources. A full description of both classification systems can be found on Statistics Canada's website.

THE MINING SECTOR, INDUSTRY CLASSIFICATIONS

MiHR has defined the sector according to the following NAICS codes, thereby providing the best correspondence between the industry's main primary and processing activities as defined by Natural Resources Canada. The NAICS codes that define the mining industry include:

- **NAICS 2121: Coal mining.** This industry group comprises establishments primarily engaged in mining bituminous coal, anthracite and lignite by underground mining, and auger mining, strip mining, culm bank mining and other surface mining.
- **NAICS 2122: Metal ore mining.** This industry group comprises establishments primarily engaged in mining metallic minerals (ores). Also included are establishments engaged in ore dressing and beneficiating operations, whether performed at mills operated in conjunction with the mines served or at mills, such as custom mills, operated separately.

- **NAICS 2131: Support activities for mining and oil and gas extraction.** This industry group comprises establishments primarily engaged in providing support services, on a contract or fee basis, required for the mining and quarrying of minerals and for the extraction of oil and gas. Establishments engaged in the exploration for minerals, other than oil or gas, are included. Exploration includes traditional prospecting methods, such as taking ore samples and making geological observations at prospective sites.
- **NAICS 3311: Iron and Steel Mills and Ferro-Alloy Manufacturing.** This industry group comprises establishments primarily engaged in smelting iron ore and steel scrap to produce pig iron in molten or solid form.
- **NAICS 3313: Alumina and Aluminum Production and Processing.** This industry group comprises establishments primarily engaged in extracting alumina.
- **NAICS 3314: Non-Ferrous Metal (except Aluminum) Production and Processing.** This industry group comprises establishments primarily engaged in smelting, refining, rolling, drawing, extruding and alloying non-ferrous metal (except aluminum).
- **NAICS 2123 Non-metallic mineral mining and quarrying.** This industry group comprises establishments primarily engaged in mining or quarrying non-metallic minerals, except coal. Primary preparation plants, such as those engaged in crushing, grinding and washing, are included.
- **NAICS 5413: Architectural, engineering and related services.** This industry group comprises establishments primarily engaged in providing architectural, engineering and related services, such as structure design, drafting, building inspection, landscape design, surveying and mapping, laboratory and on-site testing, and interior, industrial, graphic and other specialized design services. Note that only a portion of this NAIC code relates to Geosciences, Surveying and Mapping, and Assay Laboratories.

OCCUPATION CLASSIFICATION

Listed below are the 66 NOC-S codes that MiHR uses to define the occupations that are essential to the mining sector. Often an occupation can have multiple titles and it can be difficult to interpret which label is the correct one. In that instance, Statistics Canada offers a means to map or connect job titles back to the proper NOC-S code. A resource to map NOC-S codes to job titles is found on the Human Resources and Skills Development Canada website (specifically the “Quick Search” box).¹

For example, a “Quick Search” for “Haul Truck Driver — underground mining” shows that this occupation maps directly to “Underground mine service and support workers”. The site will also show which job titles are listed for each occupation category. For example “Heavy equipment operators (except crane)” include job titles such as: apprentice heavy equipment operator; heavy-duty equipment operator; heavy equipment operator; operating engineer, heavy equipment; ripper operator — heavy equipment; shovel operator — heavy equipment; spreader operator — heavy equipment; stacker operator — heavy equipment.

¹ See www5.hrsdc.gc.ca/NOC/English/NOC/2011/Welcome.aspx

NOC-S CODE	TITLE
A111	Financial managers
A112	Human resources managers
A121	Engineering managers
A371	Construction managers
A381	Primary production managers (except agriculture)
B011	Financial auditors and accountants
B012	Financial and investment analysts
B021	Specialists in human resources
B211	Secretaries (except legal and medical)
B541	Administrative clerks
B573	Production clerks
B575	Dispatchers and radio operators
B576	Transportation route and crew schedulers
C012	Chemists
C013	Geologists, geochemists and geophysicists
C015	Other professional occupations in physical sciences
C021	Biologists and related scientists
C031	Civil engineers
C032	Mechanical engineers
C033	Electrical and electronics engineers
C034	Chemical engineers
C041	Industrial and manufacturing engineers
C042	Metallurgical and materials engineers
C043	Mining engineers
C044	Geological engineers
C048	Other professional engineers
C054	Land surveyors
C111	Chemical technologists and technicians
C112	Geological and mineral technologists and technicians
C121	Biological technologists and technicians
C131	Civil engineering technologists and technicians
C132	Mechanical engineering technologists and technicians
C133	Industrial engineering and manufacturing technologists and technicians
C134	Construction estimators

NOC-S CODE	TITLE
C141	Electrical and electronics engineering technologists and technicians
C153	Drafting technologists and technicians
C154	Land survey technologists and technicians
C155	Mapping and related technologists and technicians
C162	Engineering inspectors and regulatory officers
C163	Inspectors in public and environmental health and occupational health and safety
G412	Cooks
H013	Contractors and supervisors, pipefitting trades
H016	Contractors and supervisors, mechanic trades
H111	Plumbers
H112	Steamfitters, pipefitters and sprinkler system installers
H121	Carpenters
H212	Industrial electricians
H326	Welders and related machine operators
H411	Construction millwrights and industrial mechanics (except textile)
H412	Heavy-duty equipment mechanics
H611	Heavy equipment operators (except crane)
H621	Crane operators
H622	Drillers and blasters — Surface mining, quarrying and construction
H711	Truck drivers
H812	Material handlers
H821	Construction trades helpers and workers
H822	Other trades helpers and workers
I121	Supervisors, mining and quarrying
I131	Underground production and development miners
I141	Underground mine service and support workers
I214	Mine workers
J011	Supervisors, mineral and metal processing
J111	Central control and process operators, mineral and metal processing
J121	Machine operators, mineral and metal processing
J125	Inspectors and testers, mineral and metal processing
J311	Workers in mineral and metal processing

