



Northwest Territories Mining Hiring Requirements and Available Talent Forecasts

SOURCE: THE MINE TRAINING SOCIETY

HR FORECASTS

Research was conducted by



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1. Introduction and Overview

1. Introduction and Overview

The Northwest Territories' (the NWT) mining industry has established itself as a major source of employment and economic prosperity. Over the last decade, mining activity has supported the development of a number of mining operations, advanced development and exploration projects. The industry has tremendous potential for future growth. Much of the industry's continued development will depend on its ability to attract and retain key talent. Even with a cautious economic outlook, the industry is expected to face labour market challenges in the coming years.

This report investigates the labour market pressures in the NWT's mining industry, and provides a forecast of its hiring requirements and available talent. The Mining Industry Human Resources Council's labour market forecasts for the NWT find critical shortages in many mining occupations through to 2024. Forecasts for the NWT predict hiring requirements of about 2,200 workers by 2024, under a baseline scenario — or almost two thirds of the current workforce. This outlook report also provides a forecast of available talent (i.e. the number of workers that will become available to the mining industry), as well as an analysis of the gaps in certain occupational categories. Projections indicate that for core mining occupations, the NWT's mining industry will attract roughly 990 workers over the next 10 years, to attempt to meet a requirement of almost 1,955 in those occupations.

About the Report

The Mining Industry Human Resources Council (MiHR) has prepared this report in partnership with the Government of the Northwest Territories (GNWT) and the Mine Training Society (MTS), with support from the Canadian Northern Economic Development Agency (CanNor). The report



SOURCE: THE MINE TRAINING SOCIETY

provides MiHR's forecasts of hiring requirements and available talent for the NWT's mining industry over a 10 year horizon (2014-2024). The projected gaps between hiring requirements and available talent for a select group of occupations relevant to the NWT's mining industry are analyzed and recommendations to address the gaps are discussed.

- The hiring requirements forecasts are customized to incorporate NWT-specific factors (e.g., the unique mix of minerals that are mined in the NWT) to predict change in employment and replacement requirements over a 10 year horizon, under three economic scenarios. The baseline, contractionary and expansionary scenarios are further described below. In addition to an industry-wide outlook, forecasts are also broken down for three prominent mining sectors in the NWT –mineral exploration, extraction, and support services to mining operations. Finally, forecasts are broken down for selected occupational categories relevant to the industry. The hiring requirements forecasts and occupational analysis is provided in Section 4 of this report.
- The available talent forecasts project the industry's share of talent for each exploration and mining-related occupation over a 10 year horizon, accounting for mobility trends (e.g., interprovincial and international migration) and entries/exports into mining due to various other factors (e.g., school graduates transitioning to work, retirements and other types of mining labour force separations such as moving to a different industry or province, etc.).
- A side-by-side comparison of hiring requirements and available talent for selected occupations that are core to the mining industry reveals pressure points and trends in the NWT. A gap analysis is conducted for all occupations combined, and then is broken down for each occupation. A discussion on strategies for filling the gaps follows.

Industry Definition and Scope

MiHR defines the mining industry as including all phases of the mining cycle: prospecting and exploration; construction and development; extraction; processing; and reclamation, closure, care and maintenance. All mining and mining-related projects that are classified under these categories are in the scope of the forecasts presented in this report. Forecasts presented in this report rely on data collected and aggregated through Statistics Canada. Thus, Statistics Canada's North American Industry Classification Codes (NAICS) and National Occupational Classification (NOC) codes are used to define the mining industry in this report. Specifically, MiHR uses three NAICS categories (i.e., mining, mineral exploration, and support services) and 54 NOC categories to define the NWT's mining industry. A full description on the NAICS and NOC codes included in the forecasts are found in Appendix C.

Data Collection and Methodology

MiHR forecasts rely on a variety of data inputs, mining industry intelligence, and other information that is incorporated into its models and analyses. For example, MiHR's hiring requirements forecast uses past trends and consensus forecasts in an econometric model¹ to predict mining employment and replacement requirements over a 10 year horizon. Information on known advanced development and mine construction projects are considered and captured in these hiring requirements forecasts for the NWT. These anticipated future developments are balanced against knowledge of current economic activity and consensus forecasts of future conditions,

¹ An econometric model measures past relationships among economic variables such as prices, production, interest rates, employment, and then uses these relationships to forecast how changes in some of the variables will affect the future course of other variables.



such as anticipated price fluctuations, changes in the cost of capital or other key economic factors that have a direct impact on an individual project's feasibility or development timelines. A more detailed description of MiHR's forecasting methodology can be found in Appendix A.

Industry intelligence is taken from key data sources from Statistics Canada (e.g., the *National Household Survey*, *Census*, *Labour Force Survey*, *Survey of Employment Payroll and Hours*, *Canada Business Patterns*) and other information sources such as Natural Resources Canada, Northwest Territories & Nunavut Chamber of Mines, the Northwest Territories Geoscience Office and the NWT

Bureau of Statistics. These sources cover a wide range of important themes including labour market statistics and reporting (e.g. labour force participation, separation, demographics); notable economic and demographic trends; and current and upcoming mining projects in the region.

MiHR conducted targeted surveys and interviews to gather the important expertise of employers and stakeholders in the NWT's mining, exploration and support service sectors. Findings from this 'on-the-ground' research were used to inform aspects of the modeling exercise, and validate data from other sources, such as the occupational structure of the workforce, demographic characteristics, participation and turnover. In January 2014, MiHR also hosted a mining stakeholder forum in Yellowknife to obtain valuable feedback and to strengthen the forecast, interpretations and recommendations included in this report. Participation in surveys and forums was high. Inputs were gathered from a representative cross-section of employers (response rates are not published in order to protect the privacy of respondents – given the small pool of potential participants).

Report Overview

This report is divided into six main sections:

- Section 1 provides a brief introduction and definition of industry scope
- Section 2 offers an economic overview of the NWT's mining industry and highlights the important economic variables that are considered in this report
- Section 3 summarizes the demographic trends in the NWT's mining labour market
- Section 4 provides forecasts of hiring requirements for the NWT's mining industry, broken down by industry sector and key mining occupations
- Section 5 presents a forecast of available talent by occupational group
- Section 6 includes a high-level gap analysis based on comparison of the forecasts presented for hiring requirements and available talent

The report concludes with discussion on potential strategies to address the identified labour gaps and ensure the future success of the industry.



2. Economic Overview

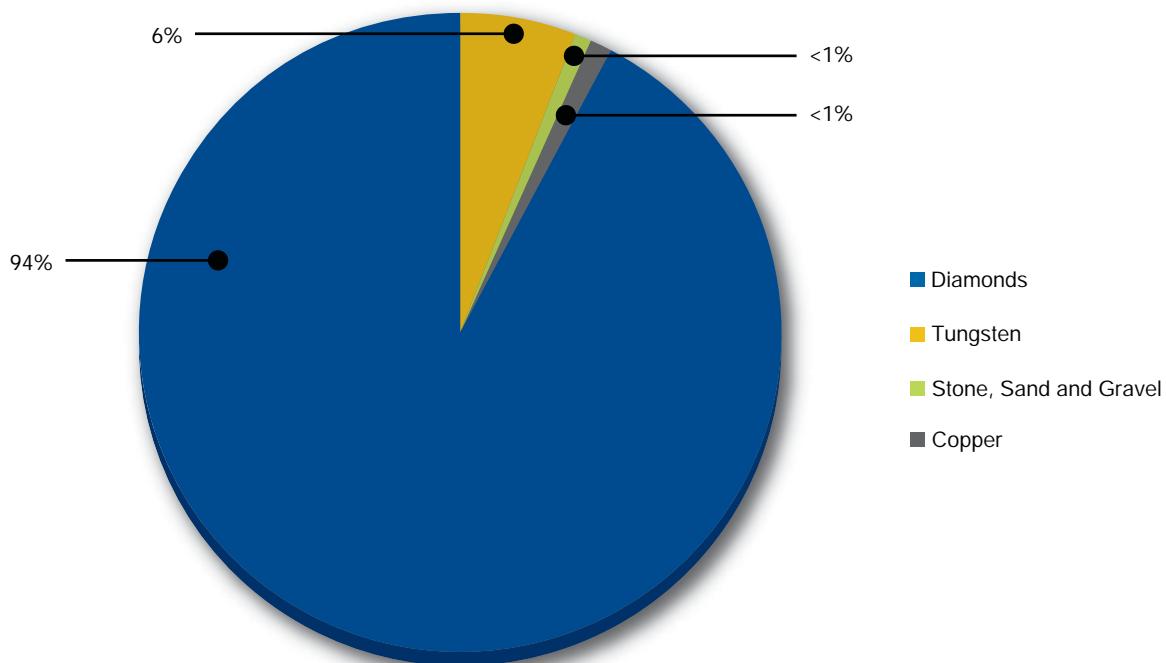
SOURCE: THE MINE TRAINING SOCIETY

2. Economic Overview

The mining industry is a leading source of economic growth and employment in the Northwest Territories. With the emergence of a number of advanced development projects, exploration projects and three producing mines coming online since 1998, mining has cemented its status as a major contributor to the NWT's economy. In 2012, non-metal and metal ore mining accounted for about 16 per cent of the territory's total Gross Domestic Product (GDP).² As a result of the industry's momentum, it is anticipated that it will continue to bring abundant opportunities to the NWT in the coming years; however, labour pressures and skills shortages may limit the industry's ability to realize this potential.

Diamonds are the main commodity produced in the NWT making up 80 per cent of the value of Canada's \$2 billion in diamond production in 2012. Figure 1 illustrates that the NWT also produced tungsten, stone, sand & gravel and copper in 2012. Though the NWT's mining industry involves a broader portfolio of mineral resources, diamonds currently dominate the production landscape. The market place for diamonds includes a number of supply chain activities that occur before diamonds reach the end consumer – including exploration, extraction, cutting and polishing, jewelry manufacturing and retail. In the NWT, the majority of industry activities are in the production of rough diamonds.

Figure 1 – The Value of Mineral Production, by Commodity, in the NWT's Mining Industry, 2012



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

² The Conference Board of Canada, Territorial Outlook – Economic Forecast, 2013

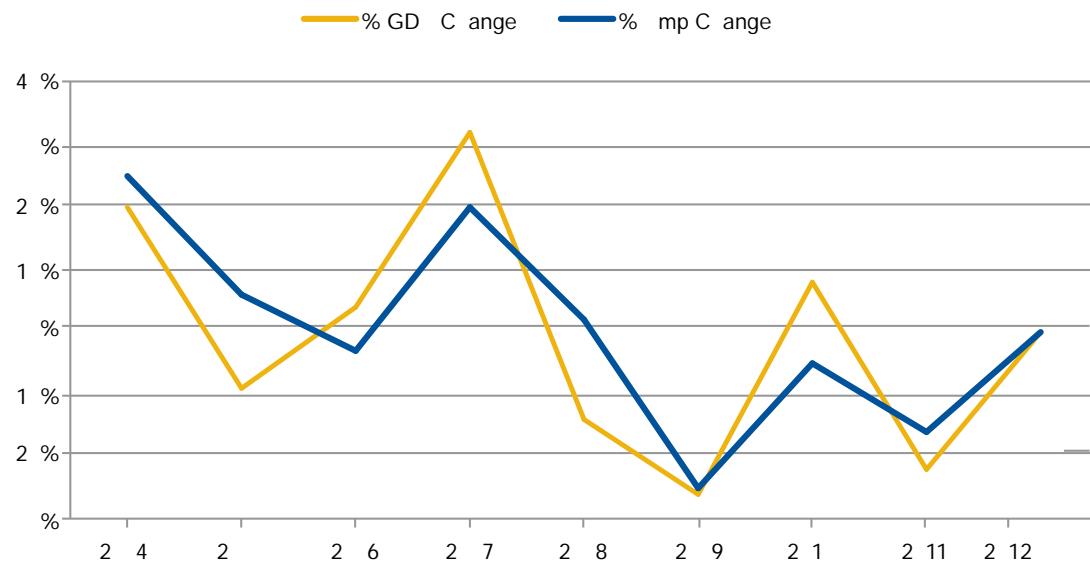
While industrial demand for diamonds is mostly met through synthetic production, the main driver of rough diamond production is the end-product jewelry market. According to Bain & Company's *2013 Global Diamond Report*³, the demand for rough diamonds is expected to grow over the next decade, particularly as the emerging middle class in China and India increase their demand for luxury goods. This expansion of global demand is also projected to overtake diamond supply in the long-term as existing deposits become exhausted, and the number of new discoveries is expected to decrease in the coming decade.⁴ A widening supply-demand gap in the rough diamond market would generate an upward pressure on diamond prices, making some projects (for example, De Beers' Gahcho Kue project), even more viable and supporting robust development opportunities in the NWT.

Gross Domestic Product Growth

Gross Domestic Product (GDP) provides a measure of economic output for an industry and a region. Research by MiHR has found that, across Canada, there is a strong correlation between GDP movement and employment.⁵ Additionally, fluctuations in mining's GDP growth and employment growth are characteristically volatile. The forecasting presented in this report accounts for natural volatility of the mining industry.

Figure 2 illustrates this volatility and the link between GDP growth and employment growth in the NWT's mining industry from 2004 to 2012. Despite the cyclical pattern observed in recent years (including a 50 per cent decrease in mining GDP from 2007 to 2012), MiHR projects that the NWT's annual mining GDP will have steady growth over the next decade. This is mainly due to the expectation of increasing diamond prices over the forecast period (2014 – 2024).

Figure 2 – Gross Domestic Product (GDP) and Employment in the NWT's Mining Industry



Source: Mining Industry Human Resources Council, 2014

3 Bain and Company, *Global Diamond Report*, 2013

4 Bain and Company, *Global Diamond Report*, 2013

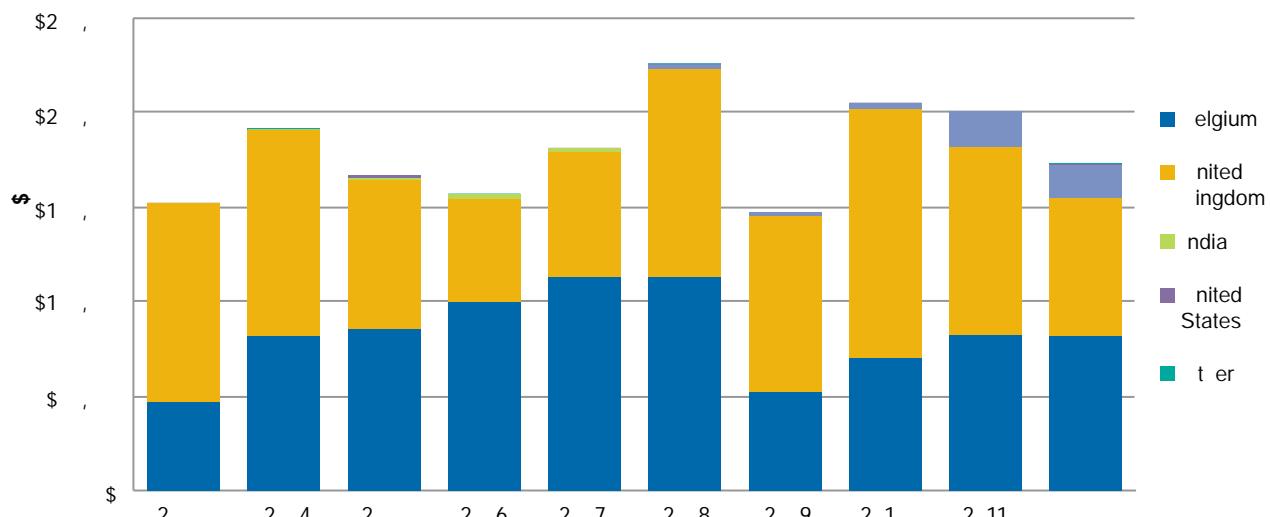
5 Mining Industry Human Resources Council (MiHR), *Canadian Mining Industry Employment, Hiring Requirements and Available Talent 10-year Outlook*, 2013

Export Outlook

As described in Figure 1, the main driver of demand for diamond extraction and, by extension, employment in the NWT diamond mining is the demand for finished diamonds in jewelry. The largest diamond-jewelry market belongs to the US, though markets in China and India are growing rapidly.⁶

However, the majority of Canada's diamond exports are in the form of rough diamonds. Figure 3 shows the value of the NWT's mineral export activity from 2003 to 2012. Diamonds represent the largest segment of exports from the NWT by an overwhelming margin. According to Industry Canada statistics, most of the NWT's exports are destined for familiar global trading hubs for rough diamonds including Europe, India, and the United Kingdom.

Figure 3 – The Value of the NWT's Diamond Exports, 2003-2012 (CDN, Millions)



Source: Mining Industry Human Resources Council, Industry Strategic Database, 2014

Europe is the largest importer of rough diamonds; however, in recent years this activity has slowed slightly due to economic concerns in Europe.⁷ India's low labour costs have made the country a centre for diamond cutting and polishing and a primary receiver of diamond imports to be processed and exported to other finished diamond markets globally.

Mineral Prices Outlook

A historical and forecasted index of diamond prices is illustrated in Figure 4. Given the significance of diamonds in the NWT's mining industry, the movement of diamond prices is one of the key determinants of production levels and of the viability of new diamond mining development in the territory. Recently the prices have experienced a significant increase from 2009 to 2011 followed by downward pressure in 2012, which can largely be attributed to recent global economic instability and uncertainty in consumer demand. Over the coming decade, diamond prices are expected to continue to increase as demand is anticipated to surpass the restricted global supply.⁸ MiHR's forecasts provided in this report utilize an existing forecast of diamond prices (illustrated in Figure 4) from WWW International Diamond Consultants Ltd.; this forecast predicts a steady increase in diamond prices from 2013 to 2024.

6 Bain and Company, Global Diamond Report, 2013

7 KPMG, Quarterly Commodity Insights Bulletin, Diamonds, 2012

8 Bain and Company, Global Diamond Report, 2013

Figure 4 – Historical and Forecasted Index of Diamond Prices



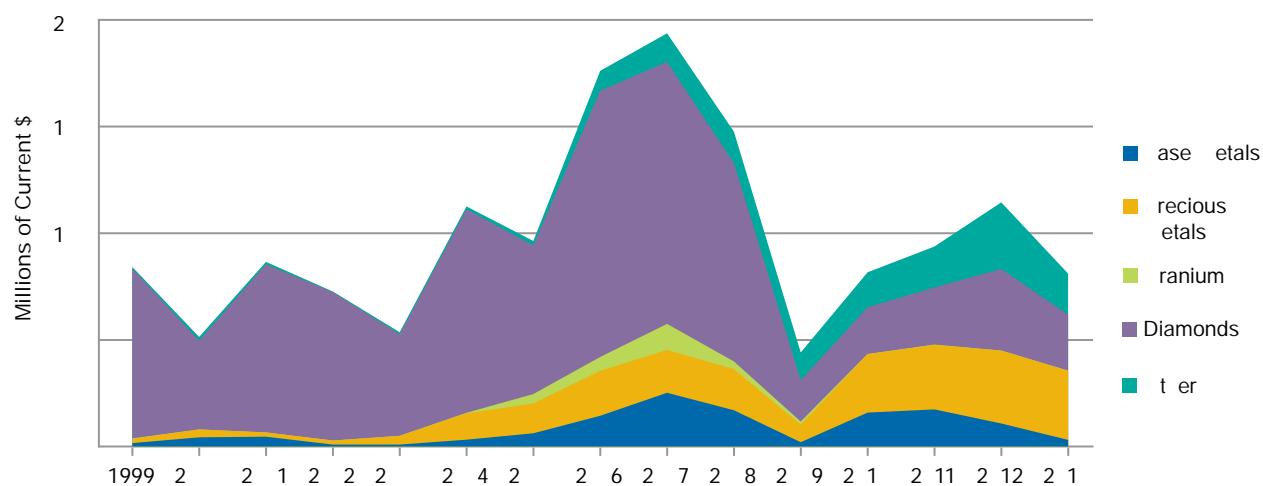
Source: WWW International Diamond Consultants Ltd, 2012

Exploration Activity

Exploration spending has rebounded since a drop in 2009, as shown in Figure 5; however, recent instability in the global economy and reluctance from the investment community has created challenges for many junior companies looking to fund their exploration activities. The NWT's exploration efforts have slowed as a result, even as future prices and demand from emerging countries is anticipated to be strong. The *NWT Mineral Exploration Overview 2013* notes Natural Resources Canada preliminary estimations (March 2013) of \$81 million in intended expenditures on exploration and deposit appraisals for the NWT are down approximately 30 per cent from 2012 preliminary estimates and 13 per cent from 2011 actual expenditures.

While the NWT's mineral production is mainly in diamonds, mineral exploration expenditures are spread across a wide variety of other commodities. Figure 5 shows that, in the early 2000s, diamonds dominated exploration spending. From 2003-2008, other commodities (i.e., base metals, precious metals, and uranium, among others) have become more established. Since 2009, exploration spending in other commodities has increased to a level that is comparable to that of diamond exploration.

Figure 5 – Value of Mineral Exploration and Deposit Appraisal Activity in the NWT, 1999-2013



Source: WWW International Diamond Consultants Ltd, 2012

The expectation that the NWT's exploration and mining industry will be able to sustain its recent momentum is fuelled by a strong demand and price outlook for diamonds in the long-term. Still, many underlying economic factors also currently point to a cautious environment, including an uncertain global economy, a careful investment community limiting access to capital markets, hard-to-find discoveries and a weakened outlook for other commodity prices. The forecasts presented in this report account for these factors and, in spite of the cautious economic trends, labour market pressures are prevalent.



3. Mining Labour Market Trends

SOURCE: THE MINE TRAINING SOCIETY

3. Mining Labour Market Trends



SOURCE: THE MINE TRAINING SOCIETY

The future strength of the NWT's mining industry will depend on a skilled labour force to ensure its future development is successful and globally competitive. This section reports trends in the NWT's mining labour force, including its size and demographic profile, which illustrates the potential pressures in the labour market. As described in the following sections, the NWT's mining labour force is relatively young compared to Canada's mining labour force. It also has fewer workers in their mid-career and older years; employs a large number of Aboriginal peoples and supports a large number of commuting workers (i.e. individuals working in the territory but living elsewhere)⁹. These demographic characteristics shape the NWT's mining labour force and its potential human resources (HR) challenges moving forward.

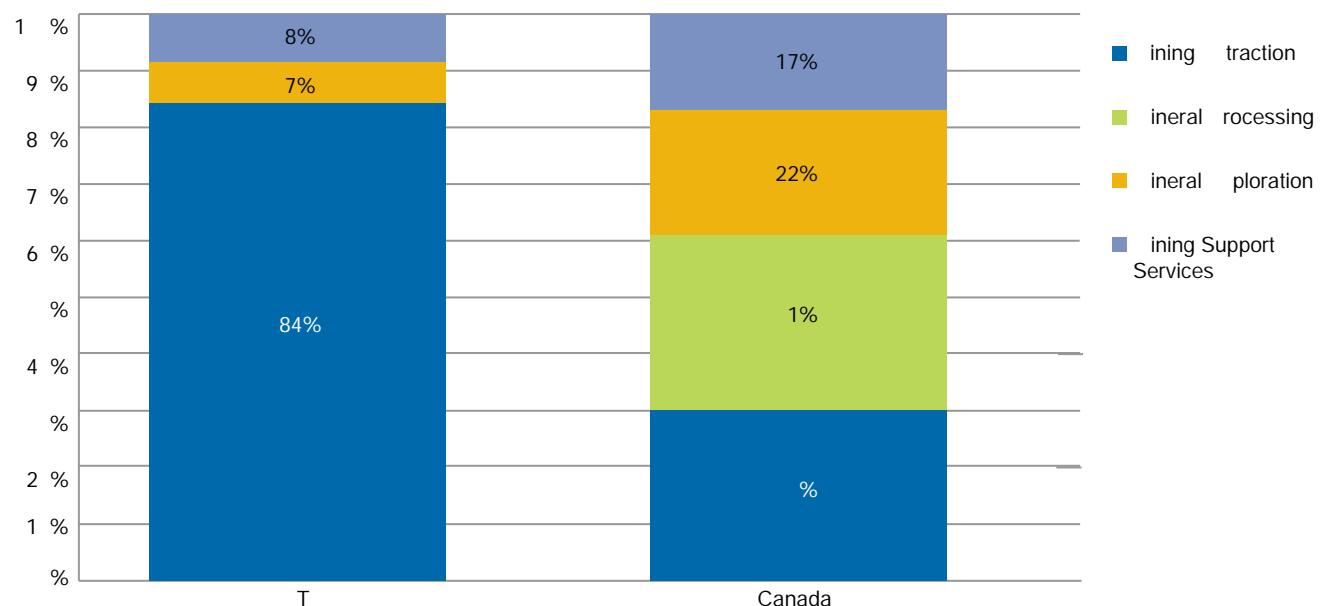
Mining Activities by Sector

Labour market characteristics vary among mining sectors. For example, the mineral exploration workforce tends to be highly mobile. In addition, many of the highly skilled workers in this sector possess years of education and experience and often delay retirement. These sector-specific factors influence the prevailing labour market pressures and determine the types of workers that will be in demand.

⁹ In this analysis, MiHR makes a distinction between the "commuter workforce" and "fly-in, fly-out workers." "Commuter workforce" refers to people who work at any mine in the NWT and live in another province or territory, whereas the remote nature of most mines in the NWT means that the majority of their workforce is "fly-in, fly-out," regardless of the province of residence.

Figure 6 displays the relative size of different mining sectors in the NWT and in Canada. The most prominent share of employment – almost 85 per cent – in the NWT’s mining industry is in extraction activities. This contrasts sharply with Canada’s mix of mining activities, where only 30 per cent of the workforce is employed in extraction and where there are substantial more refining, smelting and other secondary processing activities. Specifically, MiHR estimates employment in the NWT’s extraction sector at 3,110 workers and over 580 workers in exploration and support services in 2013. These estimates are based on data from Statistics Canada’s 2011 *National Household Survey*, MiHR’s survey of employers and various other data sources used to shape an estimate of employment in each sector (i.e., exploration spending, number and type of projects, organizational sizes and comparison with data in other regions).

Figure 6 – Employment in Mining Sectors, NWT and Canada, 2013



Source: Mining Industry Human Resources Council, 2014

Commuter Workforce

Employers in the NWT seek to first hire from the local labour force. Impact Benefit Agreements (confidential agreements between mining companies and local Aboriginal communities) and Socio-Economic Agreements (those between the mining company and the Government of the Northwest Territories) typically include commitments to mitigate negative impacts and optimize employment, training and business opportunities associated with development projects with a view to maximizing benefits to residents of the NWT. Nevertheless, due to a variety of factors, employers are still dependent on workers from other parts of Canada to supplement their workforce needs.

As a result, the mining industry in the NWT has a sizable commuter workforce - those who work in the NWT but live in another province or territory. Using data collected in MiHR’s survey of mining employers, 2011 *National Household Survey* data and the 2009 *NWT Survey of Mining Employees*, MiHR has estimated that the NWT’s mining industry draws roughly 45 per cent of its workforce from outside of the NWT. This characteristic is inherent in the mining industry in other parts of Canada as well. For example, many workers in the exploration sector work across provincial and territorial boundaries. Geoscientists, in particular, are more inclined to follow geological features in their activities than political boundaries or provincial/territorial borders.

Respondents to MiHR's survey of employers cited lack of family in the NWT and commuting distance as primary reasons for turnover in their operations. The NWT Bureau of Statistics' 2009 *NWT Survey of Mining Employees* identified potential barriers that could impact the access to the labour force both in the NWT and elsewhere (e.g., proximity to family and cost of living concerns).

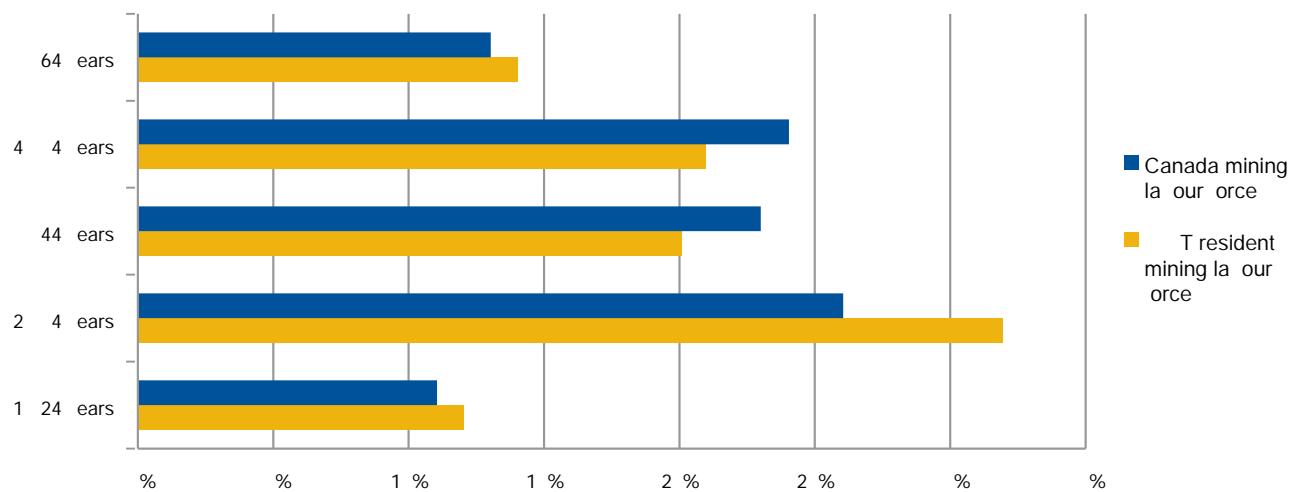
Relying on a large base of non-resident workers can also create hiring challenges as employers in the NWT must compete for commuting workers with other mining centres across the country. As labour demands shift throughout the Canadian mining industry, workers commuting longer distances may have attractive options to work closer to home.

Age Profile

Previous research by MiHR has shown that Canada's mining labour force is relatively older than in other industries.¹⁰ This trend is expected to add to the pressures of replacing experienced older workers who are entering their retirement years. The pressure is further amplified given that Canada's mining industry has historically attracted fewer younger people than other industries.

A different pattern emerges in the NWT's resident mining labour force, as shown in Figure 7. A higher proportion of the labour force falls into the 15 to 34 years age group while a lower proportion is older than seen in the rest of Canada's mining labour force. There are also fewer NWT mining workers in the 25 to 34 years and the 35 to 44 years age categories, suggesting higher mid-career attrition in the mining NWT workforce than in other parts of the country. Overall, the NWT has a relatively young population. According to Statistics Canada, the median age was 32 years in 2013, compared to Canada's median age of 40 years. This suggests that employers may not come under as much pressure to hire replacements for retiring workers. Nevertheless, the Conference Board of Canada predicts the NWT's share of 65+ year olds will increase considerably over the next decade.¹¹

Figure 7 – Age Profile of the Mining Labour Force, Canada and NWT, 2011



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

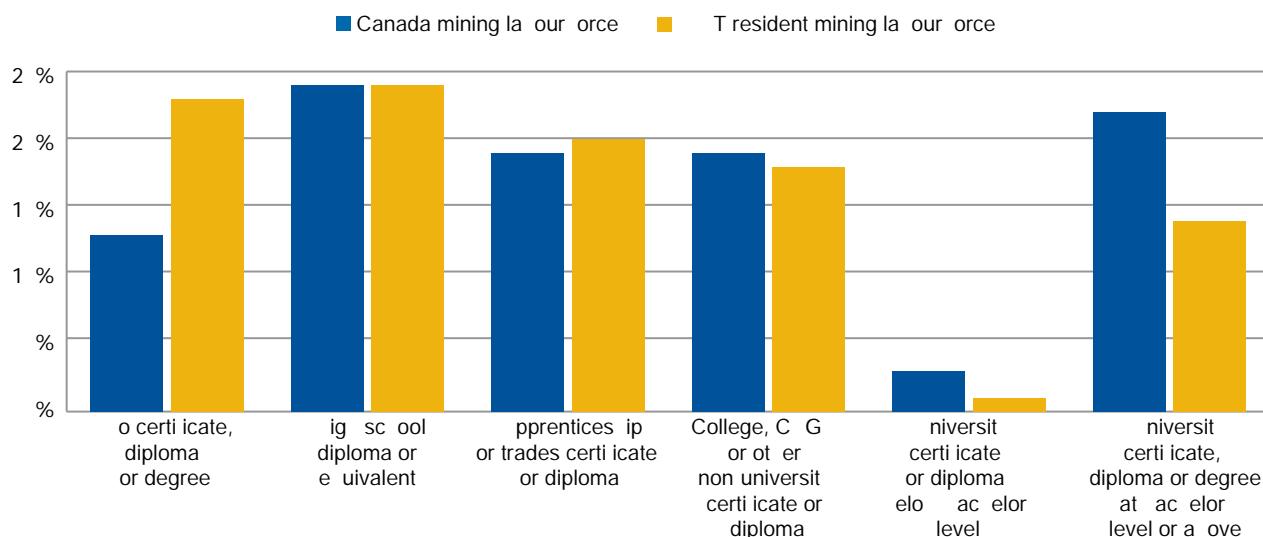
10 Mining Industry Human Resources Council (MiHR), Canadian Mining Industry Employment, Hiring Requirements and Available Talent 10-year Outlook, 2013
11 The Conference Board of Canada, Territorial Outlook – Economic Forecast, 2013

Education Profile

Figure 8 compares the educational attainment in Canada's mining labour force and the NWT's resident mining labour force. The figure reveals differences for certain educational categories in the NWT, specifically the share of those without a certificate, diploma or a university degree is shown to be much higher, whereas the share of persons with a university degree is shown to be smaller compared to Canada. In contrast, the share of those with a high school diploma, and those with an apprenticeship or trade certificate, resembles that of Canada's mining labour force.

The NWT's mining industry often turns to non-NWT residents to support their need for skilled workers. Those outside of the territory are the most likely to be called upon where there is an acute need, especially where there is a need for specific types of skills and training for the available jobs. The challenge for the NWT's mining stakeholders is to ensure they can continue to align the skills of their resident labour pool with those needed by industry.

Figure 8 – Highest Level of Educational Attainment in Canada's Mining Labour Force and NWT's Mining Labour Force, 2011



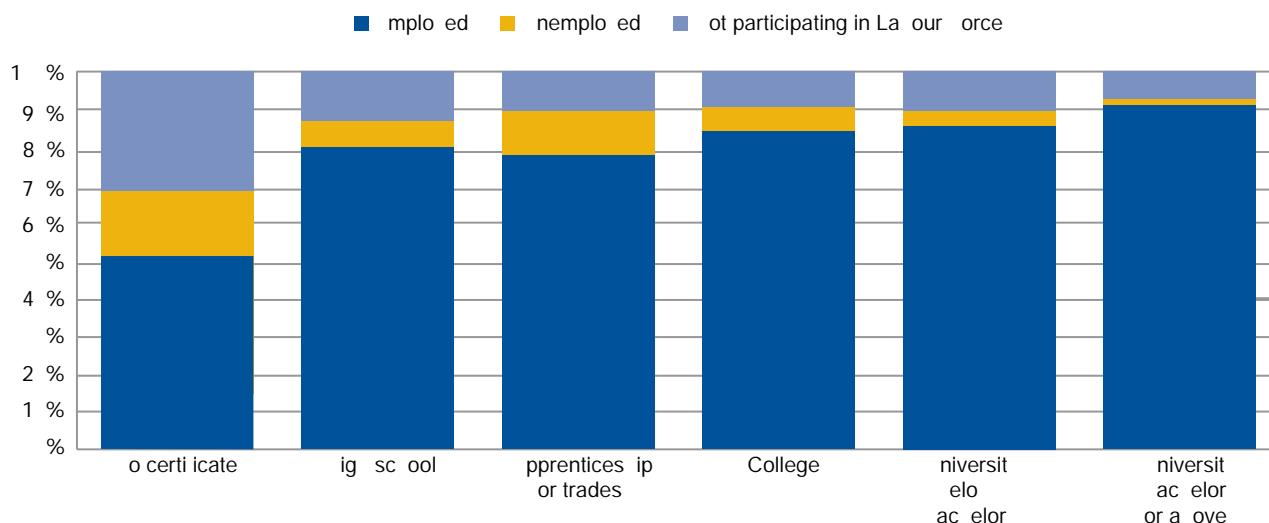
Source: Mining Industry Human Resources Council, Statistics Canada, 2014

Educational attainment has a profound impact on employment and labour force participation among the working-age population. Figure 9a shows that those without a certificate, diploma or degree are less likely to participate in the labour force and there are higher unemployment rates among those that do participate.¹² This trend is also generally true across the country, as shown in Figure 9b.

On the other hand, the return on advanced education levels is remarkably high in the NWT. Figure 9a also shows that those with an apprenticeship or trade certificate and a university degree enjoy higher participation and employment rates than their counterparts in the rest of Canada. Note that this picture only refers to employment outcomes within each educational category and does not inform on the relative size of each category.

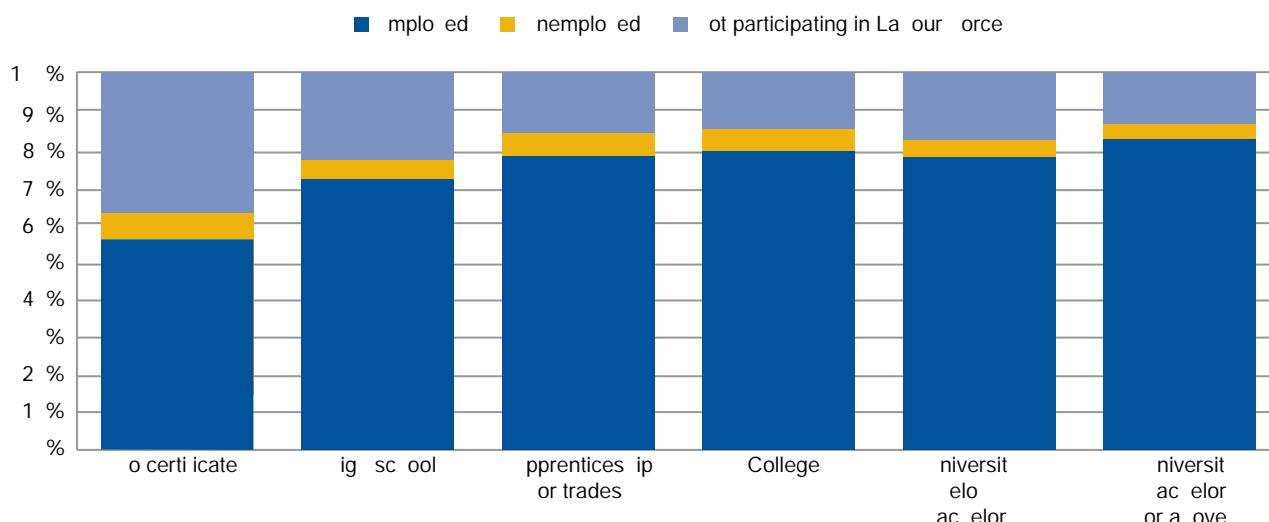
¹² Note that labour force participants are defined as those who are employed plus those who are unemployed but actively looking for work.

Figure 9a – Employment, Unemployment and Participation in the NWT, by Educational Attainment, 25 to 65 year olds, 2011



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

Figure 9b – Employment, Unemployment and Participation in Canada, by Educational Attainment, 25 to 65 year olds, 2011

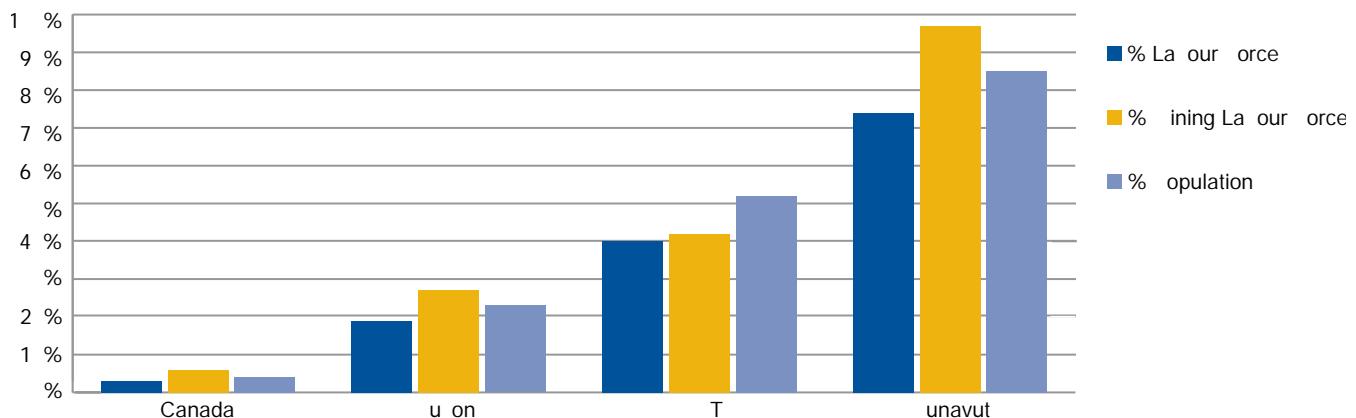


Source: Mining Industry Human Resources Council, Statistics Canada, 2014

Aboriginal Peoples

Across Canada, Aboriginal peoples represent a higher share of the mining labour force compared to other sectors, including other resource sectors. As Figure 10 demonstrates, participation of Aboriginal peoples in mining exceeds that of other industries. In the NWT, Aboriginal peoples represent about 50 per cent of the working aged population (15 and older) – thus, the future strength of NWT's mining labour force will depend greatly on their participation. Yet, the NWT is the only region shown in Figure 10 where Aboriginal peoples are less represented in mining than in the population as a whole. Therefore an opportunity exists to better engage the region's Aboriginal peoples.

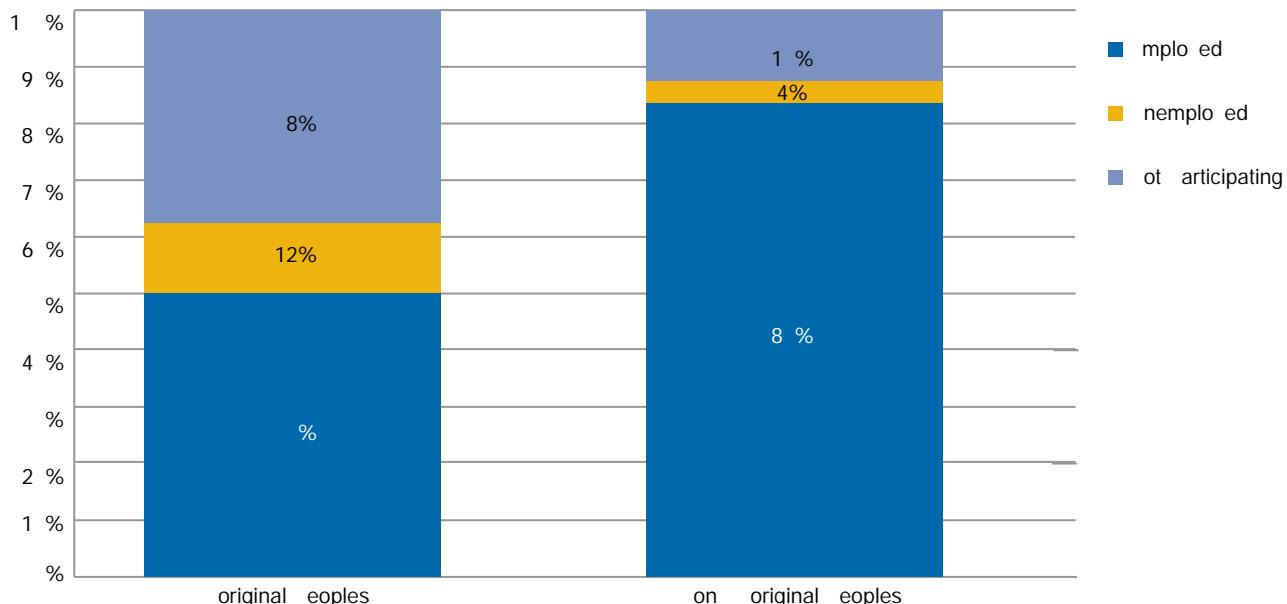
Figure 10 – Aboriginal Participation in Mining, Canada and Northern Territories, Local Labour Forces, 2011



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

The labour market outcomes of Aboriginal peoples and Non-Aboriginal peoples are shown in Figure 11.¹³ A significant proportion, nearly 40 per cent, of Aboriginal peoples do not participate in the NWT's labour force. The figure highlights the importance of access to employment opportunities in the NWT, and especially, the skills development initiatives and training programs that aim to improve the likelihood of labour force participation and employment.

Figure 11 – Labour Market Outcomes for Aboriginal Peoples and Non-Aboriginal Peoples in the NWT, 2009



Source: Mining Industry Human Resources Council, NWT Bureau of Statistics, 2014

¹³ NWT Bureau of Statistics, the NWT Community Survey, 2009

At the national level, MiHR has identified potential barriers that can restrict Aboriginal peoples' entry into certain mining occupations. These include:¹⁴

- Employer and potential employee perceptions that educational and skills levels do not meet entry requirements
- Limited employer awareness of how to find and recruit candidates and how to incorporate cultural norms into their hiring processes
- Need for improvements in HR aspects of various partnership agreements (i.e. Impact Benefit and Socio-economic Agreements)

Diversity in NWT's Mining Industry

Diverse groups, such as women and immigrants, offer the mining industry an enormous untapped source of skilled workers. Women comprise about 48 per cent of the overall labour force — but only 17 per cent of the mining labour force. In the NWT, women represent a slightly higher share of the mining labour force at approximately 22 per cent.

Immigrants are also an under-represented group in Canada's mining industry. This is especially the case in remote regions of the country as immigrants tend to move to and settle in urban centres with established immigrant populations. Immigrants account for 21 per cent of Canada's overall labour force, but only 13 per cent of the mining labour force. This pattern is similar in the NWT where immigrants represent about 10 per cent of the overall labour force, but only 7 per cent of the mining labour force.

¹⁴ MiHR, Take Action for Diversity, 2011 and MiHR, Lessons Learned: A Report on HR Components of Aboriginal Community and Mining Company Partnership Agreements



4. Hiring Requirements

SOURCE: THE MINE TRAINING SOCIETY

4. Hiring Requirements

MiHR's forecasts of hiring requirements estimate the cumulative number of workers that the industry will need to hire between 2014-2024. The estimates are greatly impacted by prevailing economic and demographic trends and activities, as discussed in previous sections of this report.

Forecasts for the NWT predict cumulative hiring requirements of approximately 2,170 workers by 2024, under a baseline scenario.¹⁵ Note that the mining workforce at the start of the forecast is estimated to be 3,690 workers under MiHR's definition of the mining industry (see Appendix C for more details). Hiring pressures are anticipated in large part from the need to replace exiting workers, including a high share of those who leave the NWT mining workforce for reasons other than retirement (jobs in other sectors or areas of the country, injury or illness, mortality). Economic indicators such as mineral price movements are also reflected in the NWT's hiring requirements forecast; the year-to-year forecast shows slight-steady growth in hiring requirements, echoing the positive price outlook for diamonds over the forecast period.

The hiring requirements forecasts presented in this report are also broken down by occupation and by industry sector. As described in the following sections, the occupational forecast finds that *Trades and Production Occupations* are among the highest in demand. The industry sector forecast finds that jobs in *Extraction* will make up the largest share of hiring requirements.



SOURCE: THE MINE TRAINING SOCIETY

Description of the Model

MiHR uses an economic model to forecast employment and hiring requirements for the mining industry over a 10 year horizon. The model accounts for the factors affecting the size and composition of the workforce and uses a combination of independent economic forecasts, Statistics Canada data, and information collected directly from industry stakeholders. Details on the hiring requirements model and the methodology used to develop forecasts can be found in Appendix A.

Hiring requirements have two distinct components – 'Net Change in Employment' and 'Replacement Requirements.' The following describes these components in more detail.

¹⁵ The baseline scenario uses existing forecast inputs (such as minerals prices, labour productivity, capital stock) from a variety of sources, including the World Bank, and projects expectations of hiring requirements for the industry. Two other scenarios are also given; the contractionary and expansionary scenarios respectively represent the pessimistic and optimistic forecast relative to the baseline scenario.



SOURCE: THE MINE TRAINING SOCIETY

Net Change in Employment

MiHR's employment model predicts changes in employment through factors that are tied to levels of economic activity. Net change in employment describes the industry's adjustment to new mining developments (openings/closures) as well as cycles of economic activity. Previous research by MiHR has demonstrated that fluctuations in employment have a strong correlation with movements in mining GDP.

Note that the forecast tables that follow do not show new job growth, but rather represent a net estimate of employment change over the entire forecast period. Net change in employment equally reflects new and increased mining activity with negative workforce adjustments due to mine closures and slowdowns in production. For example, a new mine may open leading to 500 new jobs being created; however, along with this expansion activity, exploration activity elsewhere may have concerns about their business environment, and reduce the workforce by 250 workers – this combined activity would result in a net change in employment of 250 workers. Note that this example is a hypothetical scenario and is unrelated to the forecasts provided below.

GDP and Employment Forecasts

MiHR builds a forecast of GDP using region-specific commodity prices and other key economic drivers. Intelligence on historical and current price movements, labour productivity, upcoming mining projects and other important indicators of economic trends are also taken into consideration. MiHR's projections for the NWT, under a baseline scenario predict steady growth in mining industry employment to 2024.

Employment Levels and Multiplier Effects

The employment forecasts and subsequent hiring requirements forecasts discussed here reflect only employment in the mining industry, including exploration, mining, and supply services. It is reasonable to assume that incidental or secondary employment would result as a consequence of industry activity however, estimation of a specific employment multiplier for NWT mining jobs was not undertaken in this study and is outside of the scope of this project.

Replacement Requirements

Replacement requirements describe the need to replace workers due to retirement and non-retirement separations (i.e. migration, mortality, turnover, illness or injury). Together these factors contribute to the number of exits from the workforce that are not a direct consequence of changing economic conditions, but rather result from the natural behaviour of labour force participants.



Still, the industry's need to replace exiting workers will fluctuate depending on the prevailing economic conditions. MiHR assumes that not every exit will turn into a hiring replacement. The likelihood that a workforce exit is replaced by the industry is adjusted for three scenarios in this analysis. Under an expansionary scenario, MiHR assumes that 100 per cent of exits will be replaced; this replacement rate is assumed to be marginally less under the baseline scenario, and reduced further under a contractionary scenario.

Retirement

MiHR uses demographic information (e.g., age and educational background) to predict the retirement behaviour of the NWT's mining labour force over the forecast period. A brief description of this is found in Appendix B. At the national level, retirement influences the largest segment of forecasted hiring requirements. Given that the NWT's mining labour force is relatively young, retirement is not anticipated to have the same impact on hiring needs compared to other mining regions in Canada. Hence the NWT's estimated retirement is relatively modest for all years of the forecast. However, the retirement rate for all mining sectors is projected to slightly increase over the forecast horizon; the inclusion of the commuter workforce into this estimate increases the projected rate of retirement.

Non-Retirement Separation

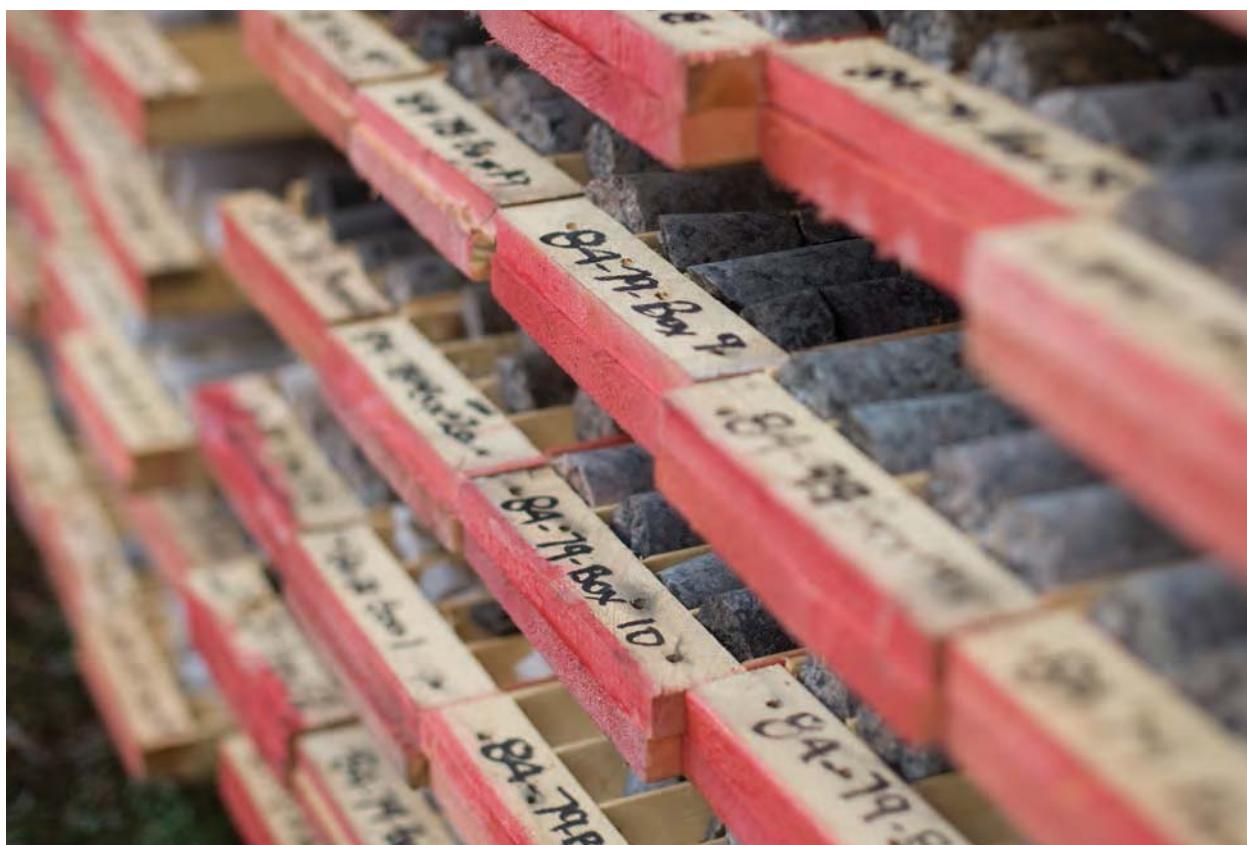
The non-retirement separation rate used in MiHR's forecasts captures all other separation behaviour that is not related to retirement. MiHR has estimated the non-retirement separation rate to be roughly 4 per cent for the NWT's mining industry. The NWT's large segment of non-resident workers and the high degree of labour mobility presents challenges in estimating non-retirement separation rates. For the purposes of this study, estimates were created for the total mining labour force (including non-residents) and then validated against other research inputs. Previous MiHR research found that the national non-retirement separation rate in the mining industry is about 2 per cent; however, this rate will be higher for any given region of the country, due to interprovincial migration.

Survey responses from industry employers in the NWT indicated an average turnover rate of approximately 15 per cent in 2012; however, workers leaving a particular mining company may remain in the NWT's mining industry. Thus, 15 per cent represents the upper-limit of the territorial non-retirement separation rate. Given these limits, MiHR has estimated the non-retirement separation rate for the mining workforce in NWT to be 4 per cent – a conservative figure that is between the employer-reported rate and the national industry separation rate. This estimate is further balanced against out-migration statistics produced by Statistics Canada and mobility data from Statistics Canada's 2011 *National Household Survey*.

Hiring Requirements Forecasts

The scenarios presented in this report are based on the “total workforce” to capture the industry’s overall needs in the next decade. This includes both the workforce that is living in the NWT and a sizable commuter workforce living outside of the NWT. By including the commuting segment of the workforce, the forecasts below present a complete picture of the industry’s employment needs and ultimately its leading labour market pressures.

Note that employment estimates based on Statistics Canada data alone refer to NWT residents and not the total mining workforce. Hence, MiHR includes other data sources and indicators in its estimates of employment in order to reflect the total mining workforce. Estimating the total workforce is especially challenging in the exploration and support services due to their extremely mobile nature. For these sectors, a number of metrics (i.e., exploration spending, number and type of projects, organizational sizes, and comparison with data in other regions) and consultation with key informants were used to shape an estimate of total employment.





MiHR's hiring requirements forecasts are built on three scenarios – baseline, contractionary and expansionary. Under the baseline scenario, various factors (i.e., NWT-specific commodity prices, mining GDP, labour productivity, etc.) are aligned to leading economic forecasts and combined with industry intelligence (i.e., major mine construction and advanced development activities) to arrive at a projection of total employment. Under the baseline scenario, steady growth is expected in the industry. The expansionary scenario assumes greater-than-expected growth, while the contractionary scenario assumes lower-than expected growth.

Both expansionary and contractionary scenarios take into account historical economic trends as well as consensus forecasts of future trends, and they are further supported by intelligence of the NWT's mining industry.

Cumulative Hiring Requirements

MiHR estimates that the NWT's mining industry employed roughly 3,690 people in 2013. Table 1 shows the output of MiHR's hiring requirements forecasting model for the NWT mining industry over the next decade (2014-2024) under the three economic scenarios described above. Under the contractionary scenario, MiHR's model forecasts that total employment in mining will decline by 260 jobs whereas the baseline scenario predicts about 8.5 per cent growth in employment (310 jobs) and the expansionary scenario projects the creation of about 480 new jobs (13 per cent increase in total employment).

The 10-year cumulative hiring requirements are projected to be 2,170 workers under a baseline scenario; 3,100 workers in an expansionary scenario; and 340 workers in a contractionary scenario. As described above, these hiring requirements are driven mostly by replacement requirements.

Table 1 – Cumulative Hiring Requirements Forecasts, by Scenario – to 2024

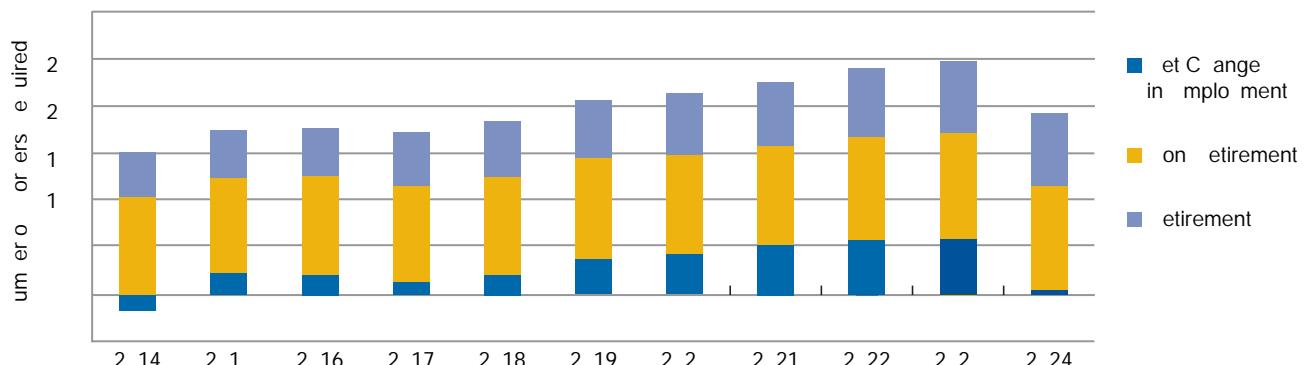
	Net Change in Employment	Replacement Requirements		Cumulative Hiring Requirements 2015
		Retirement	Non-Retirement	
Contractionary	-260	440	160	340
Baseline	310	690	1,170	2,170
Expansionary	480	920	1,170	3,100

Source: Mining Industry Human Resources Council, 2014

*Note that numbers may not add perfectly due to rounding. Also note that hiring requirements do not translate to new job growth; they reflect the combination of net change in employment and replacements.

Figure 12 provides a year-by year breakdown of the hiring requirements under a baseline scenario. On an annual basis, hiring requirements average about 200 workers per year; non-retirement exits or industry churn account for about half of hiring pressures over the forecast.

Figure 12 – Annual Hiring Requirements Forecast, Baseline Scenario – 2014-2024



Source: Mining Industry Human Resources Council, 2014

* Captures the collective activity for mining, mining support services and exploration.

Table 2 shows positive cumulative hiring requirements over 2, 5, and 10-year horizon for each scenario.

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

	Cumulative Hiring Requirements		
	2016	2019	2024
Contractionary	90	170	340
Baseline	490	1,050	2,170
Expansionary	690	1,480	3,100

Source: Mining Industry Human Resources Council, 2014

Hiring Requirements Forecasts by Occupational Category

Table 3 provides the cumulative hiring requirements for broad occupational groups, under a baseline scenario. The table shows the greatest number of hiring requirements will be in *Trades and Production Occupations*. Of course, high demand in terms of numbers does not necessarily translate to high concern or difficulty to find. For example, the need to hire over 100 professional and physical science workers may be more of a challenge or require longer term planning than other categories given the education and job experience requirements needed to replace retiring workers in this category.

The categories shown in Table 3 consist of key occupations identified by MiHR to be core to the mining industry. These occupations are defined by the National Occupational Classification (NOC) categories (see Appendix C for a complete list). Section 6 reports on hiring requirements for each mining occupation (See Table 8, Column 1).

Notable occupations with the highest projected hiring requirements include:

- Underground Production and Development Miners
- Central Control and Process Operators, Mineral and Metal Processing
- Construction Trades Helpers and Labourers
- Construction Millwrights and Industrial Mechanics (except textile)
- Industrial Electricians
- Underground Mine Service and Support Workers
- Geologists, Geochemists and Geophysicists
- Supervisors, Mining and Quarrying

Table 3 – Cumulative Hiring Requirements Forecast, by Broad Occupational Categories
Baseline Scenario – 2016, 2019, 2024

	Cumulative Hiring Requirements		
	2016	2019	2024
Trades and Production	340	745	1,550
Professional and Physical Sciences	20	50	105
Human Resources and Financial	5	15	35
Support Workers	10	45	95
Technical	20	40	70
Supervisors, Coordinators, and Foremen	20	45	100
All Other Occupations	75	110	215
Total	490	1,050	2,170

Source: Mining Industry Human Resources Council, 2014

Hiring Requirements Forecasts by Industry Sector

Hiring requirements forecasts are also broken down for three industry sectors – extraction, mineral exploration, and mining support services. These forecasts illustrate each sector's unique labour market characteristics as well as their separate responses to forecasted conditions.

Table 4 presents cumulative hiring requirements for each sector under a baseline scenario. Extraction also has the largest share of forecasted hiring requirements, which reflects the larger size of the sector, a moderately optimistic outlook for commodity prices, and encompasses projects coming online as well as current producers shifting their production capacity over time. Among the sectors, mineral exploration is expected to have the most modest hiring needs as the global economic climate continues to dampen the sector's growth potential. The side-by side sector forecasts indicate that non-retirement exits are a significant contributor of hiring pressures in all sectors.

Table 4 – Cumulative Hiring Requirements Forecast, by Industry Sector, Baseline Scenario – to 2024

	Employment in 2013	Net Change in Employment	Replacement Requirements		Cumulative Hiring Requirements
			Retirement	Non-Retirement	
Mineral Extraction	3,110	230	690	990	1,900
Mining Support Services	270	70	50	110	230
Mineral Exploration	310	0	50	80	140
Total Mining (All three Sub-Sectors)	3,690	310	690	1,170	2,170

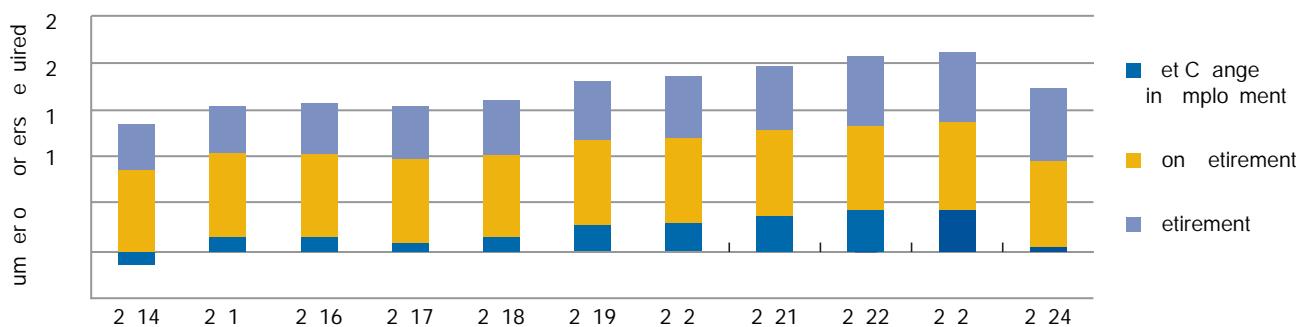
Source: Mining Industry Human Resources Council, 2014

*Note that numbers may not add perfectly due to rounding. Also note that industry sector definitions and classification schemes may constrain some of the data analysis. For example, “exploration” and “support services” may include or exclude activities that the sector traditionally would categorize differently.

Mining Sector Hiring Requirements

Figure 13 illustrates the year-by-year hiring requirements forecast for the mining sector under a baseline scenario. The extraction sector is projected to have positive hiring requirements over the next 10 years. Net change in employment is expected to have modest-steady growth. The largest share of hiring requirements stems from the need to replace workers in the non-retirement separation category. Retirements, while less pronounced, are projected to have steady growth in the extraction sector.

Figure 13 – Annual Hiring Requirements Forecast, Mining, Baseline Scenario – 2014-2024



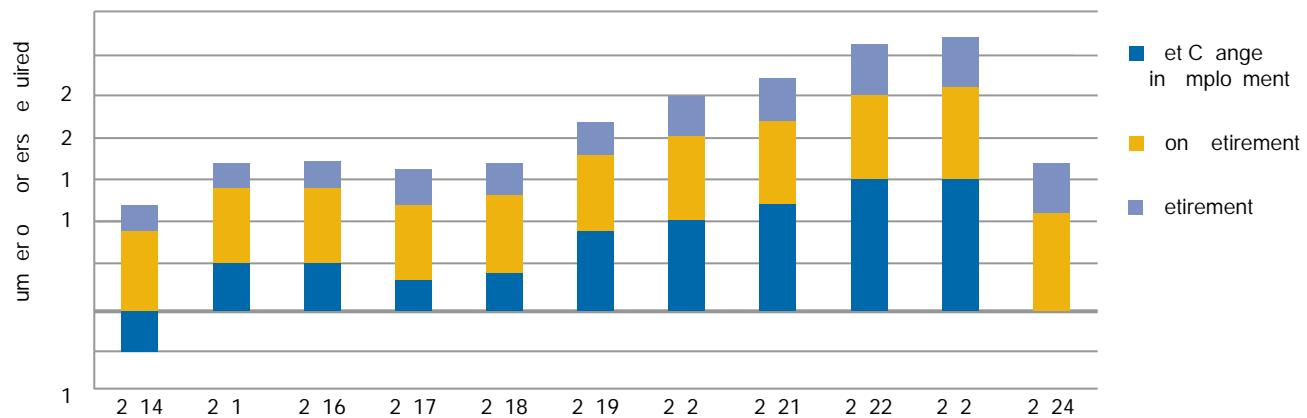
Source: Mining Industry Human Resources Council, 2014

Mining Support Services Sector Hiring Requirements

The mining support services sector specifically refers to services that support mining and exploration operations, usually on a contract basis. One example is contract diamond drilling, though this sector covers a range of activities including shaft sinking, electrical and mechanical services etc. Figure 14 illustrates the year-by-year hiring requirements forecast for the mining supply services sector under a baseline scenario. The mining support services sector is expected

to respond to changing developments in the mining and exploration sectors. The forecasts for this sector show steady growth over the forecast horizon. The largest segments of hiring needs are expected to come from net change in employment and non-retirement separation. Conversely, retirement, as a share of hiring requirements, is shown to be relatively less significant in this sector.

Figure 14 – Annual Hiring Requirements Forecast, Mining Support Services, Baseline Scenario – 2014-2024

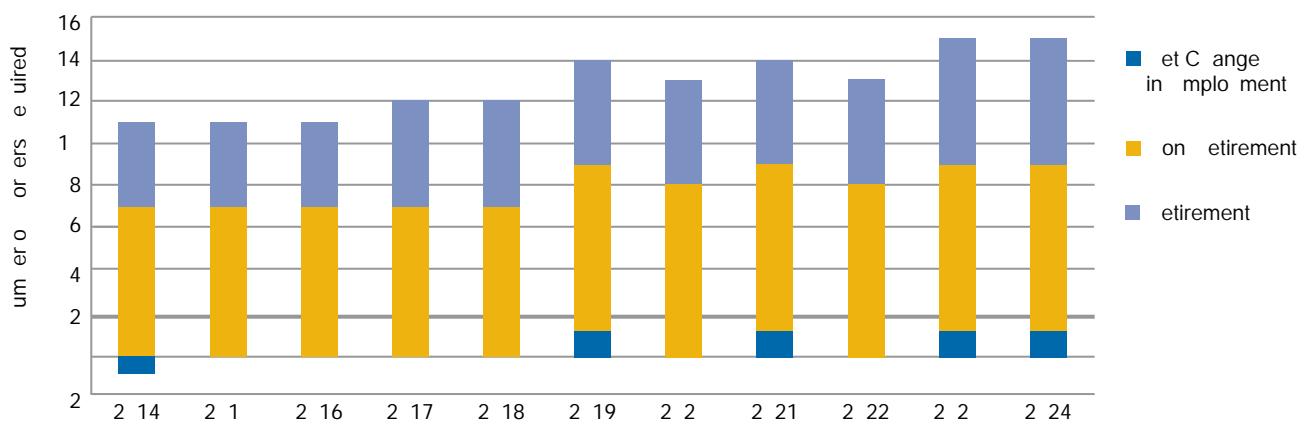


Source: Mining Industry Human Resources Council, 2014

Mineral Exploration Sector Hiring Requirements

Figure 15 illustrates the year-by-year hiring requirements forecast for the mineral exploration sector under a baseline scenario. New job growth is expected to stagnate somewhat over the next 10 years due to a slow economic outlook and the cautious mood amongst investors in the exploration sector. However, the net change in employment is projected to be overshadowed by greater replacement requirements. Non-retirement separation exhibits the largest segment of hiring needs followed by retirement.

Figure 15 – Annual Hiring Requirements Forecast, Mineral Exploration, Baseline Scenario – 2014-2024



Source: Mining Industry Human Resources Council, 2014



5. Available Talent

5. Available Talent

Available talent describes the potential talent pool for the industry to fill positions and offset their hiring requirements. The hiring requirement forecast (described in Section 4) estimates the number of hires the industry will need to make in order to keep activities at a competitive level over the next 10 years. This primarily depends on anticipated economic conditions and demographic factors. However, to fully understand labour market pressures, the hiring requirements model must be balanced with an estimate of the workforce that, under existing conditions, is expected to be available to fill those positions.

MiHR has developed a model of labour supply that projects the amount of talent that will be available to fill positions over the forecast horizon. The forecast is based on historical patterns and assumes the existing state of affairs will continue through the time horizon. Thus, by not making assumptions about strategies and policies yet to be instigated, the available talent forecast exposes labour pressures as they are expected to evolve based on conditions that exist today.

Description of the Model

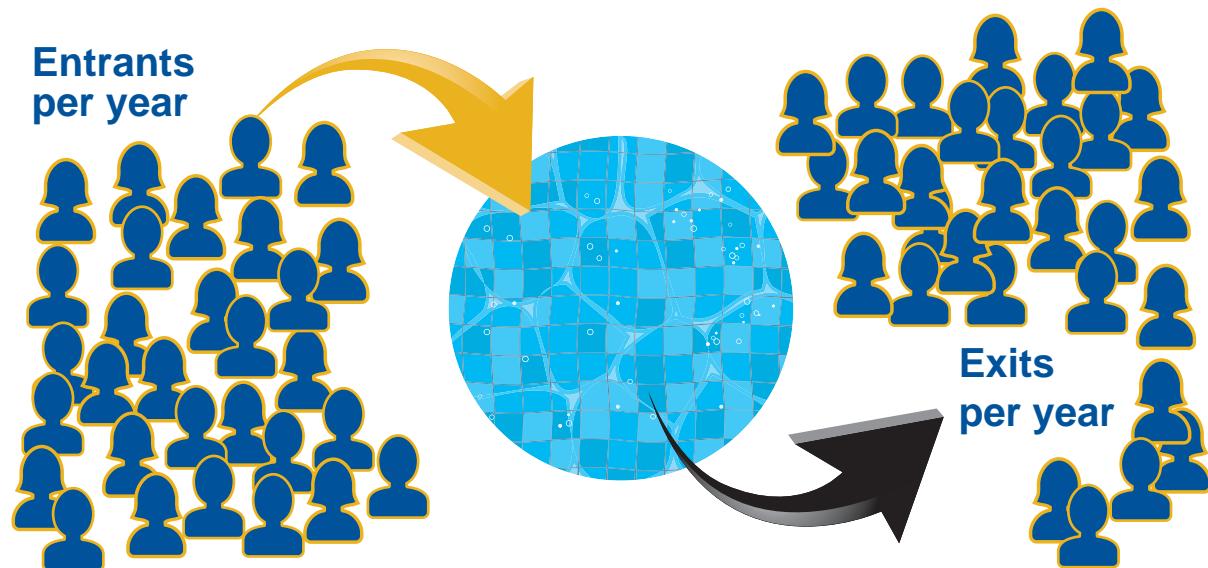
MiHR's model for available talent is provided for specific occupations identified to be critical to the mining industry. The model first projects, for each occupation, the pool of labour that the mining industry is expected to draw from, and then predicts the proportion that the mining industry will successfully attract in a given year. For example, of the total labour pool for all *Heavy Equipment Operators* in the NWT, there are an estimated 475 available in 2024, and the mining industry is



predicted to attract 51 per cent of them. The share that the mining industry is predicted to attract is based on historic patterns, and reflects the industry's traditional capacity to attract talent compared to all other industries drawing from that same occupation pool. Note that this proportion varies among occupations depending on how specific an occupation is to the mining industry and how stable it is over time.

Forecasts of the labour pool were prepared for selected mining-related occupations of interest (see Appendix C for a complete list). This list was then trimmed to 54 core occupations, given some of the occupations were not relevant to the NWT. In a given year, the forecast begins with the previous year's labour pool, and then considers the flow of workers projected to enter and exit during the course of the year. A detailed description of the model and its assumptions can be found in Appendix B.

The Labour Pool for Mining-Related Occupations



Entrants: The main sources of new entrants include individuals leaving high school or post-secondary school to join the workforce; individuals coming to the NWT from other countries (international migration) or other provinces (interprovincial migration); and “others” such as people changing occupations and those re-entering the workforce after a temporary absence.

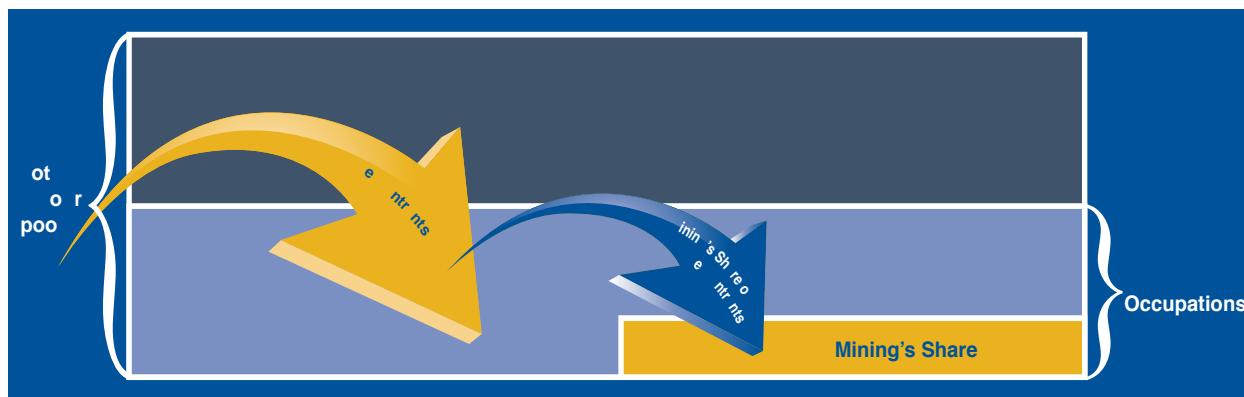
Exits: The sources of labour force exits include individuals leaving the NWT to work in other countries or other provinces; workers who have retired; and “others,” such as people changing occupations or those who fall ill, are disabled, or deceased.

Available Talent Forecasts

The available talent forecast specifically refers to the new entrants to the labour pool—in other words, workers who potentially offset the industry's hiring requirements. As illustrated by Figure 16, not all individuals entering a particular occupation (e.g., Carpenters) will work in mining. For the selected occupations, MiHR first estimates the number of new entrants that will be available in the labour pool for all industries (the large yellow arrow) and then calculates mining's share of these

entrants (the small blue arrow) — based on historic trends. The cumulative number of workers that the mining industry will attract describes the available talent figures presented in this report.

Figure 16 – An Illustration of the Labour Pool and Available Talent



Source: Mining Industry Human Resources Council, 2014

Even though the forecast assumes a continuation of past trends in the forecasting period, it is possible that the “status quo” will change over time as new education and training programs and industry/education initiatives are introduced to address the currently projected gaps. It is therefore important to revisit the forecasts and gap analysis on a regular basis, to update assumptions and to track the impact of new initiatives on the gaps and analyses presented here.

Table 5 presents the forecast of available talent over a 2-, 5- and 10-year time horizon. MiHR’s available talent forecasting model (see Appendix B) predicts that approximately 4,090 new workers will enter the selected occupations for all industries in the NWT over the 2014-2024 forecast period. Assuming that mining will continue to attract talent at historical rates for these occupations, the mining industry is expected to attract 990 new entrants in those occupations over the coming decade. A detailed list of all occupations and the associated cumulative share of available talent can be found in Table 8 (in the talent gap analysis section of this report).

Table 5 – Cumulative Available Talent, All Industries and Mining, Selected Occupations – 2016, 2019, 2024

	2016	2019	2024
Total entrants for select occupations, for all industries	340	710	1,280
Mining's share of entrants for select occupations (assuming historical rate of attraction)	20	60	120

Source: Mining Industry Human Resources Council, 2014

Labour Market Pressures

The degree to which talent is difficult to find can vary among occupations. For the mining industry, finding talent for a particular occupation can become harder because (1) the labour pool for that occupation shrinks over time, and/or (2) the mining industry relies heavily on that occupation, and



SOURCE: THE MINE TRAINING SOCIETY

is thus sensitive to changes in its labour force.

Some occupations (e.g., *Plumbers, Secretaries*) are typically found in other industries and the mining industry accounts for a small share of total employment in those occupations. Other occupations (e.g., *Underground Production and Development Miners, Mining Engineers*, etc.) are very industry-specific and for these, the mining industry accounts for the majority of total employment. Taking a closer look at the pressures in the talent pools for each occupation gives the mining industry important information about future challenges and opportunities.

Table 6 illustrates the relative pressures in the different occupational talent pools — whether a particular pool is growing or shrinking, and what that means for the mining industry — based on how industry-specific the occupation is. This illustration is not to be confused with a gap analysis. It does not take into account projected hiring requirements; it simply illustrates projected trends in various talent pools as a function of how much of that talent pool is employed in mining.

For some occupations, such as *Plumbers*, the industry attracts fewer members of the total labour pool and the overall size of the labour pool is expected to increase; this means that pressures to find workers is weak for this occupation. For other occupations, such as *Underground Mine Service and Support Workers*, the talent pool is projected to shrink over time and the mining industry attracts almost all of the workers in this occupation; therefore, the shrinking talent pool will have a strong negative impact on industry employers.

Table 6 – Labour Pool Pressures, by Occupation

	Gains in Labour Pool	Steady	Loss in Labour Pool
Very High	<ul style="list-style-type: none"> Mining engineers Engineering managers Supervisors, mining and quarrying Drillers and blasters - Surface mining, quarrying and construction Machine operators, mineral and metal processing 	<ul style="list-style-type: none"> Production clerks Heavy equipment operators (except crane) Underground production and development miners Mine labourers Central control and process operators, mineral and metal processing 	<ul style="list-style-type: none"> Primary production managers (except agriculture) Construction millwrights and industrial mechanics (except textile) Underground mine service and support workers
High	<ul style="list-style-type: none"> Geologists, geochemists and geophysicists Administrative clerks Land surveyors Geological and mineral technologists and technicians Biological technologists and technicians Heavy-duty equipment mechanics Material handlers 	<ul style="list-style-type: none"> Specialists in human resources Inspectors in public and environmental health and occupational health and safety Cooks Industrial electricians Welders and related machine operators 	<ul style="list-style-type: none"> Human resources managers Truck drivers Other trades helpers and labourers
Medium	<ul style="list-style-type: none"> Financial managers Construction trades helpers and labourers 	<ul style="list-style-type: none"> Secretaries (except legal and medical) Carpenters 	<ul style="list-style-type: none"> Financial auditors and accountants
Small	<ul style="list-style-type: none"> Transportation route and crew schedulers Mapping and related technologists and technicians Plumbers 	<ul style="list-style-type: none"> Biologists and related scientists Construction managers Dispatchers and radio operators Engineering inspectors and regulatory officers Crane operators 	<ul style="list-style-type: none"> Chemists Mechanical engineers Geological engineers Contractors and supervisors, mechanic trades Land survey technologists and technicians Labourers in mineral and metal processing

Source: Mining Industry Human Resources Council, 2014

Available Talent Forecasts by Industry Sector

A sector-specific analysis of available talent is possible to the extent that occupations are assumed to belong to a particular industry sector. For example, available talent for occupations such as *Underground Miners* will likely impact production, while available talent for *Geologists* will be expected to impact mineral exploration.



6. Talent Gap Analysis

Understanding the gaps between hiring requirements and available talent is important, as it can inform the development of targeted strategies and initiatives to fill the gaps. To this end, MiHR's gap analysis provides a side-by-side comparison of hiring requirements and available talent for the key occupations that are core to the NWT's mining industry. The gap analysis brings together outcomes from previous sections in this report to determine the gaps between hiring requirements and available talent. Given that available talent is an occupation-based forecast, the occupation-level hiring requirements forecast (as reported in Section 4) is used to provide an appropriate comparison.

Table 7 summarizes the projected gaps for the selected occupations combined. In the top row, the available talent forecast for the NWT's mining industry is given for the next 2-, 5- and 10-years. The middle row provides MiHR's hiring requirements forecast for the key occupations under a baseline scenario (estimated at about 90 per cent of the industry-wide hiring requirements). The bottom row is the difference between the top and middle rows, and reveals the forecasted gap between hiring requirements and available talent. The forecast predicts the cumulative available talent will not be sufficient to meet the forecasted hiring requirements, assuming the "status quo" will continue. Specifically, the industry is expected to attract only 990 new entrants to meet hiring needs of 1,955 - leaving a shortfall of 965 workers by 2024.

Table 7 – Cumulative Available Talent, All Industries and Mining, Selected Occupations – 2016, 2019, 2024

	2016	2019	2024
Mining's share of entrants for selected occupations (assuming the historical rate)	260	550	990
Hiring requirements for selected occupations	415	940	1,955
The gap	-155	-390	-965

Source: Mining Industry Human Resources Council, 2014

*Note: To ensure appropriate comparisons, these figures do not include the full industry-wide hiring requirements forecast, but rather only the forecast for broad occupational groups to be consistent with available talent forecasts.

Occupational Gap Analysis

The nature of talent gaps varies among occupations. In some cases, there is an existing pool of talent and the industry must strive to attract more new entrants from this pool into mining careers (i.e., carve out a larger slice of the pie). In other cases, there simply aren't enough people in the talent pool to meet the industry's needs, let alone the demands from other industries (i.e., there is a need to make the pie bigger). In all cases, the mining industry must strive to retain the workers it already employs and to make the best possible use of talent (e.g., through technology, innovation, improved productivity, and appropriate skills and knowledge development).

A talent gap can also have a different impact, depending on the occupation. This is especially true for jobs that are highly specialized and require years of training and experience. A seemingly small

gap can pose a challenge when there are only a few people with the specialized skills and experience to perform the role. The analysis presented in this report presents gaps in terms of raw numbers, but this analysis should be balanced with the awareness that not all the illustrated talent gaps are mission-critical or high-concern gaps.

Table 8 provides the side-by-side comparison of hiring requirements and available talent for each occupation and shows that the size of the talent gaps varies among the occupations considered in this report. The figures represent cumulative counts over a 10-year horizon to 2024. Occupations are grouped into broader categories. Among these categories, the *Trades and Production Occupations* collectively exhibit the largest gap between hiring requirements and available talent. The occupations in these categories are expected to face a greater challenge as available talent will not meet the predicted hiring requirements.

The three right-hand columns entitled “The Challenge” show (1) the available talent pool for all industry sectors, (2) mining’s historic share of the labour pool and (3) an estimate of the share mining will need to attract to meet its projected hiring requirements. These columns can be used to gauge the degree that the industry needs to change its historical share in order to meet its future hiring needs. For example, *Trades and Production Occupations* have an available talent forecast of 1940—for all industries; of that number, the mining industry is projected to attract 25 per cent based on historical patterns; yet, the industry is projected to require 80 per cent of what is available to all industries.

Table 8 – The Gap and Challenge in the NWT, by Occupation, to 2024

	The Need	Available Talent & Gap		The Challenge		
		Cumulative Hiring Requirements	Available Talent – Mining’s Share	Gap	Total Available Talent – All Industries	Mining’s Share
TRADES AND PRODUCTION						
Underground production and development miners	605	60	-545	60	96%	
Central control and process operators, mineral and metal processing	245	10	-235	10	100%	
Construction trades helpers and labourers	140	10	-130	340	3%	
Construction millwrights and industrial mechanics (except textile)	75	20	-55	40	54%	
Industrial electricians	70	20	-50	60	34%	
Underground mine service and support workers	60	20	-40	20	100%	
Labourers in mineral and metal processing	45	< 5	-45	< 5	< 1%	

	The Need	Available Talent & Gap		The Challenge		
	Cumulative Hiring Requirements	Available Talent – Mining's Share	Gap	Total Available Talent – All Industries	Mining's Share	Mining's Required Share
Mine labourers	45	30	-15	30	89%	
Heavy equipment operators (except crane)	45	90	45	180	49%	
Truck drivers	40	80	40	470	18%	
Welders and related machine operators	35	20	-15	80	27%	
Heavy-duty equipment mechanics	30	30	< 5	120	24%	
Material handlers	30	40	10	210	21%	
Drillers and blasters - Surface mining, quarrying and construction	25	30	5	30	100%	
Machine operators, mineral and metal processing	20	10	-10	10	100%	
Other trades helpers and labourers	20	< 5	-20	< 5	44%	
Steamfitters, pipefitters and sprinkler system installers	15	< 5	-15	< 5	< 1%	
Plumbers	5	< 5	-5	70	< 1%	
Crane operators	< 5	< 5	< 5	< 5	< 1%	
Carpenters	0	10	10	210	3%	
Total	1,550	480	-1,070	1,940	25%	80%
PROFESSIONAL AND PHYSICAL SCIENCES						
Geologists, geochemists and geophysicists	50	70	20	160	44%	
Mining engineers	40	70	30	90	78%	
Metallurgical and materials engineers	10	< 5	-10	< 5	< 1%	
Chemists	5	< 5	-5	50	< 1%	
Other professional engineers, n.e.c.	< 5	< 5	< 5	< 5	< 1%	
Geological engineers	< 5	< 5	< 5	< 5	< 1%	
Industrial and manufacturing engineers	< 5	< 5	< 5	< 5	< 1%	
Mechanical engineers	< 5	< 5	< 5	< 5	< 1%	
Biologists and related scientists	< 5	< 5	< 5	60	< 1%	
Total	105	140	35	360	39%	29%

	The Need	Available Talent & Gap		The Challenge		
	Cumulative Hiring Requirements	Available Talent – Mining's Share	Gap	Total Available Talent – All Industries	Mining's Share	Mining's Required Share
HUMAN RESOURCES AND FINANCIAL						
Specialists in human resources	15	10	-5	110	12%	
Financial auditors and accountants	10	10	< 5	140	10%	
Human resources managers	5	< 5	-5	30	10%	
Financial managers	5	10	5	180	6%	
Total	35	30	-5	460	7%	8%
SUPPORT WORKERS						
Inspectors in public and environmental health and occupational health and safety	30	10	-20	50	26%	
Secretaries (except legal and medical)	30	10	-20	170	3%	
Cooks	10	40	30	250	14%	
Dispatchers and radio operators	10	0	-10	40	< 1%	
Administrative clerks	10	30	20	110	26%	
Inspectors and testers, mineral and metal processing	5	< 5	-5	< 5	< 1%	
Engineering inspectors and regulatory officers	< 5	< 5	< 5	< 5	< 1%	
Construction estimators	< 5	< 5	< 5	< 5	< 1%	
Transportation route and crew schedulers	< 5	< 5	< 5	20	< 1%	
Production clerks	< 5	10	10	10	54%	
Total	95	100	5	650	15%	15%
TECHNICAL						
Land survey technologists and technicians	20	< 5	-20	20	< 1%	
Land surveyors	20	10	-10	90	15%	
Mapping and related technologists and technicians	15	< 5	-15	50	< 1%	
Geological and mineral technologists and technicians	15	30	15	70	43%	
Biological technologists and technicians	< 5	20	20	50	29%	
Total	70	60	-10	280	21%	25%

	The Need	Available Talent & Gap		The Challenge		
	Cumulative Hiring Requirements	Available Talent – Mining's Share	Gap	Total Available Talent – All Industries	Mining's Share	Mining's Required Share
SUPERVISORS, COORDINATORS, AND FOREMEN						
Supervisors, Mining and Quarrying	50	40	-10	50	83%	
Supervisors, Mineral and Metal Processing	45	< 5	-45	< 5	< 1%	
Engineering Managers	5	100	95	170	60%	
Contractors and Supervisors, Mechanic Trades	< 5	< 5	< 5	30	< 1%	
Primary Production Managers (except Agriculture)	< 5	40	40	50	74%	
Construction Managers	< 5	< 5	< 5	50	< 1%	
Total	100	180	80	350	51%	29%

Source: Mining Industry Human Resources Council, 2014

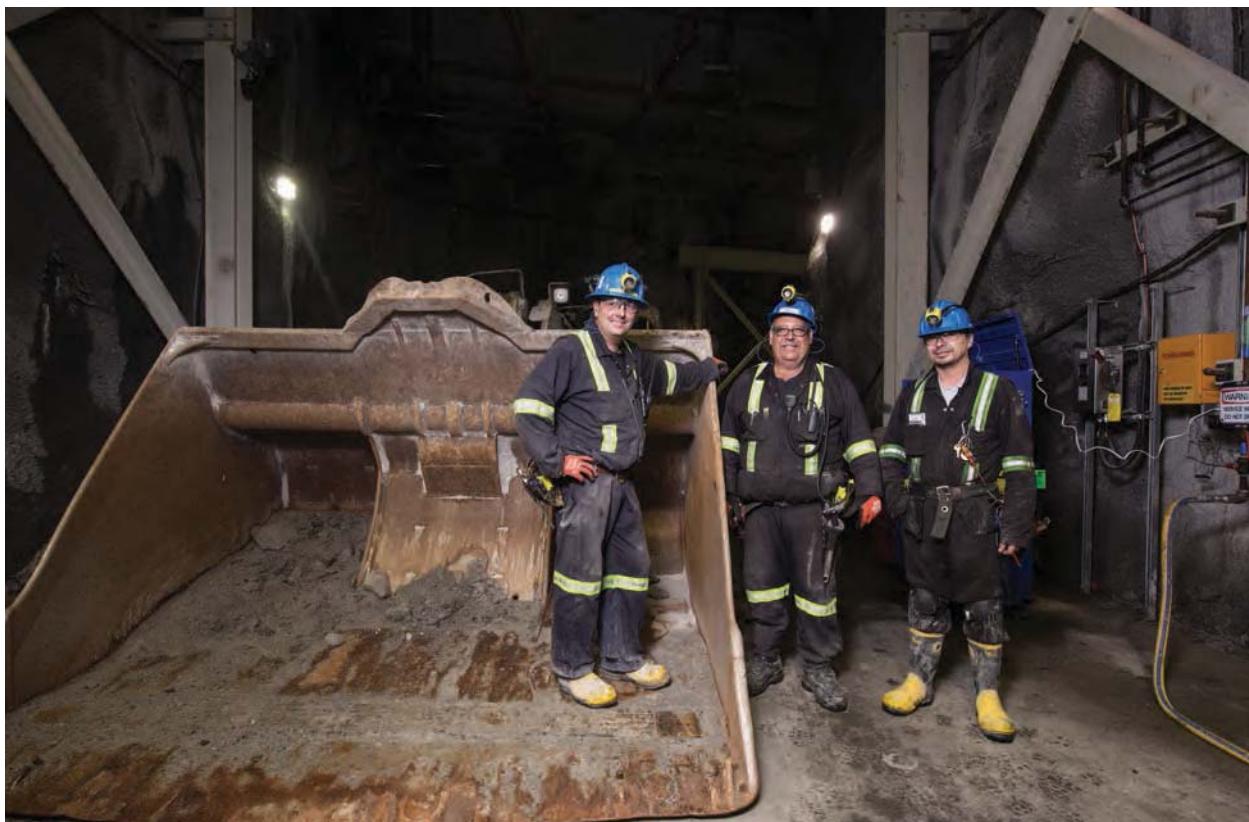
The lack of available talent in certain occupations is a concern with respect to the industry's ability to meet its hiring needs. Targeted strategies and initiatives are required to increase the labour pool and to attract more workers to the mining industry. Improving upon the available talent numbers presented will be an important step in addressing the gaps.

Types of Talent Gaps

The cumulative talent gap alone does not shed light on how best to address the labour shortages. A more detailed look at each occupation reveals unique characteristics and trends. Three distinct gaps emerge in this analysis.

Figures 17, 18 and 19 which follow offer a visualization of the gaps presented in Table 8. The columns represent the available talent for all industries; the dark blue portion of the columns represent mining's share of available talent; the yellow squares denote the hiring requirements. A gap for a particular occupation is found if the hiring requirements (yellow square) outstrips mining's share of available talent in that occupation (dark blue). In some cases the hiring requirements also surpasses the total available talent for all industries (the entire column) indicating another type of gap. Three specific types of gaps are further explored in the following discussion.

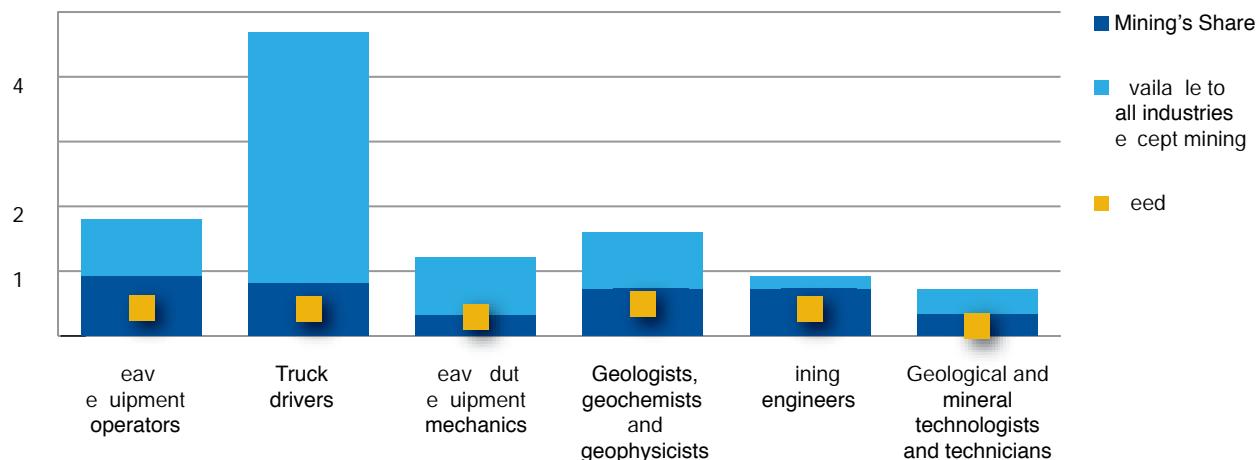
1. Retain and Develop the Workforce: For occupations in this category, the labour supply is sufficient for the forecasted labour needs, and strategic efforts should focus on retaining the workforce through engagement, retention and development initiatives. These strategies often aim to preserve competitiveness with other industry sectors — by offering strong compensation packages, flexible work options, and career development opportunities.



SOURCE: THE MINE TRAINING SOCIETY

Figure 17 illustrates examples of occupations which exhibit this type of gap (e.g., *Heavy Equipment Operators, Truck Drivers, etc.*). As highlighted by the figure, the mining industry is projected to have access to sufficient numbers in key physical science and technical occupations (e.g., *Geologists, Geological Technologists and Technicians, and Mining Engineers*) – a pattern that is similar in Canada’s mining industry.¹⁶ Surprisingly, projections for the NWT’s mining industry show sufficient numbers in a few key trades and production occupations (e.g., *Heavy Equipment Operators, Truck Drivers and Equipment Mechanics*).

Figure 17 – Focus on Retention and Development, Projected Gaps - to 2024



Source: Mining Industry Human Resources Council, 2014

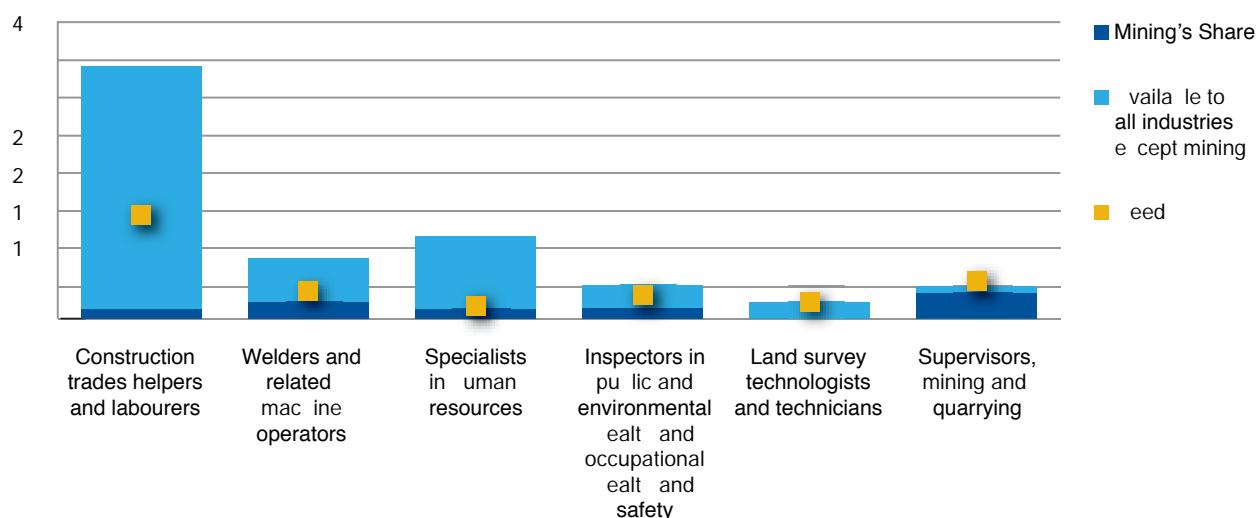
16 Mining Industry Human Resources Council (MiHR), Canadian Mining Industry Employment, Hiring Requirements and Available Talent 10-year Outlook, 2013

Although future supply in these occupational categories will be sufficient to meet the industry's needs, the retention and development of these workers is imperative as recruitment for these positions has proven to be challenging for mining. In addition, as competition for this talent heats up between mining and other industries, workers' options to work elsewhere or in other sectors will be enhanced and mobility is likely to increase.

2. Increase Mining's Share of Labour Pool: For occupations exhibiting this type of gap, there is a healthy labour pool to draw from, but mining has not traditionally attracted enough of them to meet its own future needs. For occupations in this category, the industry faces fierce competition from other industries — all in need of workers with similar skills, knowledge and experience. As a result, the mining industry must compete to capture a larger share of the pool through strategic efforts to attract more labour market participants into careers in mining.

Figure 18 shows examples of gaps for occupations in this category (e.g., *Construction, Trades Helpers and Labourers, Welders and Related Machine Operators, etc.*). Here the hiring needs (yellow) outstrip mining's share (dark blue) indicating a talent gap for the industry in that occupation. Each broad occupational category has examples of occupations with this type of talent gap.

Figure 18 – Increase Mining's Share of Talent, Projected Gaps - to 2024



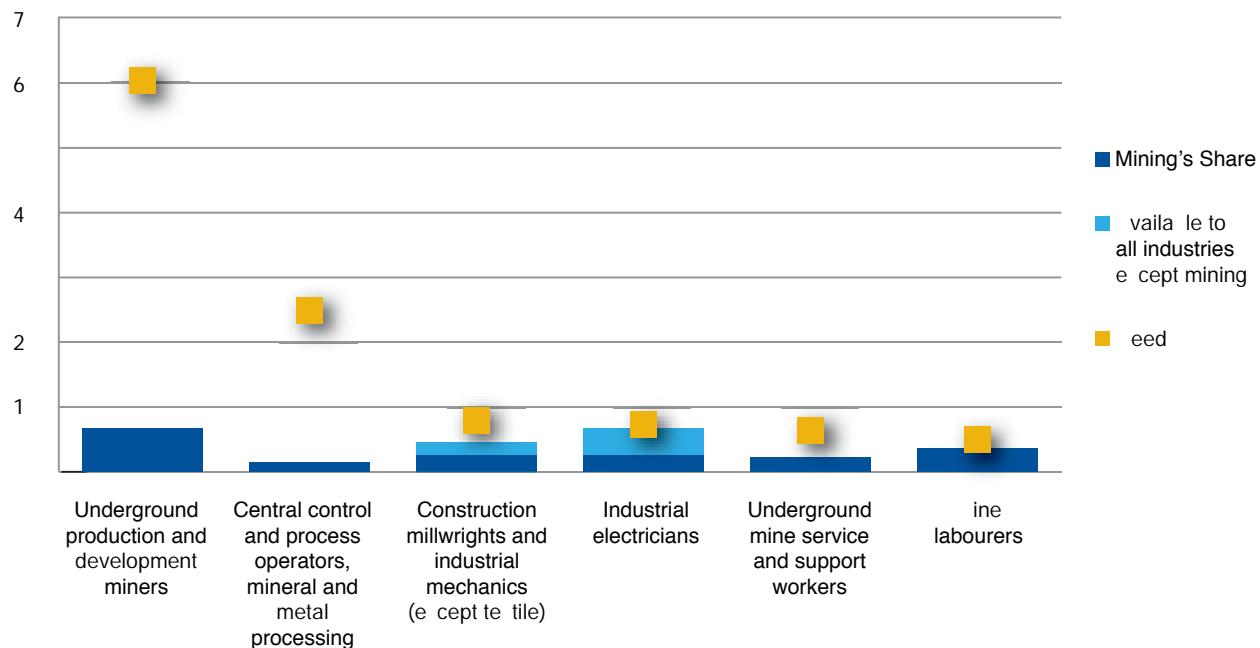
Source: Mining Industry Human Resources Council, 2014

Occupations in this category tend not to be highly mining-specific and are particularly vulnerable to broader labour market competition, therefore, the industry must increase awareness of career opportunities among people in these talent pools. Once the industry intensifies its attraction efforts, other industries will respond with their own heightened efforts to retain or attract new talent. Because of this pressure among industries, mining's share of talent is remarkably stable over time and extremely difficult to influence. Strategic and coordinated industry-wide efforts will be critical for mining as it strives to address the gaps for these types of occupations.

3. Grow the Labour Pool: For occupations in this category, there simply will not be enough new talent entering the labour pool over the next 10 years to meet hiring needs. These occupations require considerable growth in the labour pool in order to meet the forecasted requirements and in many cases the deficits are large.

Figure 19 highlights examples of gaps for occupations in this category (e.g., *Underground Production and Development Miners*, *Central Control and Process Operators*, *Mineral and Metal Processing*, etc.). The forecasted available talent is not sufficient to support the needs of the mining industry for these occupations, even if the industry was able to attract 100 percent of the available talent. In particular, many of the *Trades and Production Occupations* exhibit labour pool deficiencies.

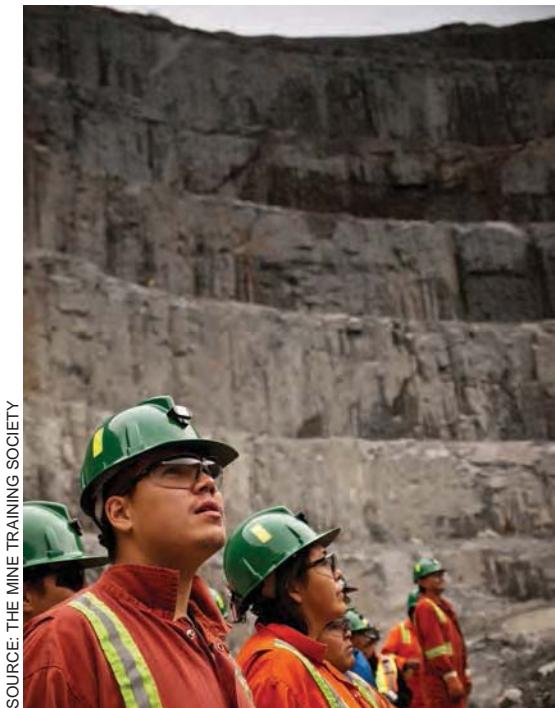
Figure 19 – Grow the Talent Pool, Projected Gaps - to 2024



Source: Mining Industry Human Resources Council, 2014

Occupations with this type of gap tend to be mining-specific. That is, for many of these occupations, mining already captures a substantial share (or all) of the available talent. Therefore, efforts to increase competition with other industries for existing available talent will be less impactful than increasing the overall talent pool size.

The industry may collaborate with other industries, education providers, immigration program coordinators and others to increase the available talent pool for all industries. It is also important to note that solutions to these gaps involve real increases in new talent — in other words, workers who are not already employed in the sector. When labour market conditions tighten, a natural reaction is to compete with other mining employers to fill positions with workers already employed in the sector. This tactic does not address the labour pool deficits as it only shuffles current employees among employers.



SOURCE: THE MINE TRAINING SOCIETY

Addressing the Gaps

Just as the nature of the talent gaps differ, so too do the strategies to address the gaps. There are many initiatives, partnerships, and programs that will ensure the industry is well positioned to meet its needs. Encouraging youth to remain in the NWT and to work in the industry after graduation will address labour shortages. The mining industry could further grow the labour pool and optimize the existing workforce by developing the capacity to train workers in time to meet the escalating demand. Skills and experience gaps are of greatest concern to employers in this area.

Increase Mining's Share of Available Talent

Increasing the share of talent for any one industry is a difficult undertaking. As the labour market tightens, it becomes exponentially more difficult for a particular industry to attract more new entrants in the face of competition from other industries. In addition, the ability of the mining industry to attract talent from other

sectors can be limited by unfavorable public perceptions about mining's social and environmental impacts. This includes factors and perceptions related to working or living in remote locations (e.g. high cost-of-living, limited access to recreation and leisure activities, and the pressures of working a rotational schedule). In order to better define appropriate strategies, it would be valuable to conduct a review of the social and economic impacts of these factors for the mining industry workforce.

A plan to increase mining's share of available talent is often supported through partnerships and collaborative efforts among mining industry employers, education providers and other stakeholders. For instance, mining stakeholders can work with education providers to promote mining as a career of choice. This may include a strategy that begins at the grade school level and incorporates mining-related examples in the curriculum.

Across Canada, tight labour markets have driven employers to offer more competitive salaries, increase benefits, and attempt to attract new talent with perks, bonuses, more vacation time and other incentives. While these strategies may result in short-term gains, they can be costly and not sustainable over the longer term. Employers may also look to compete for talent within their own local industry; but this essentially moves around talent that is already employed, as opposed to increasing an industry's share of new entrants to the labour force.

Growing the Labour Pool

In addition to attracting more talent from an available pool, mining industry stakeholders will need to increase the number of new entrants into the NWT's overall mining labour pool in order to meet forecasted hiring requirements. This will require stakeholders, (i.e. employers, educational institutions, governments and associations) to coordinate their efforts to attract people at all entry points including: boosting education and training to increase the numbers of school graduates; re-attracting labour force leavers (such as retired workers) and attracting other entrants, including international and provincial migrants.

Engaging the local labour force is an important step in expanding the labour pool and will help to reduce the dependency on commuters for skilled workers. This includes initiatives to train and develop the skills of the local Aboriginal workforce so that they are able to fill available mining positions. The industry can also take steps to better include Aboriginal peoples by incorporating cultural customs and norms into all levels of operations. Finally, the industry can enlarge their labour pool by attracting groups that are traditionally under-represented, such as women and immigrants. In addition, strategies to promote mining to young people will be important as youth may not be fully aware of the mining industry and the range of job opportunities available to them.

Education and Training

Challenges:

There are significant gaps in trades and technology occupations. Addressing these gaps will be central to reducing labour market pressures. However, strategies to address these pressures must overcome challenges related to education and training:

- As shown in Figure 8 (in Section 3 of this report), about 22 per cent of the resident NWT mining workforce does not have a high school diploma; employers are thus challenged to find territorial applicants with the skills and training to fill the gaps in many of the trades and production occupations.
- Aboriginal training and education needs continuous attention and support. Companies and communities often struggle to find individuals with essential skills.
- It is important to consider the time it takes to train and develop the needed experience to be fully competent on the job. Therefore, overcoming supply pressures might be challenging, or unfold over a longer time horizon than discussed here. For some occupations, the ability to train and develop talent will be manageable if immediate action is taken (e.g., for underground mine service and support workers). For other occupations, a blend of short-term and longer-term solutions will be needed (e.g., professional geoscientists).



Solutions:

Addressing the challenges will involve both short and long-term strategies:

- Proactive solutions will prepare the NWT's labour market for future opportunities. These include strategies such as developing opportunities for career exploration for youth, improving access to career information before grade 12, early emphasis on mining-related subjects (i.e., math and sciences) and maintaining high standards for education.
- Addressing commuter workforce challenges and growing the territorial labour force begins with education and training. Placing an emphasis on Aboriginal training and education – including efforts to develop essential skills, provide early career awareness and occupational training with a commitment to hire may help to remove barriers for Aboriginal peoples looking to pursue careers in mining.
- The projected gaps in this report refer to a 10 year horizon, therefore eliminating the barriers also requires a long-term strategy. For instance, the NWT's Mine Training Society partners with Aboriginal governments and mining employers to evaluate and train Northerners and Aboriginal peoples with the long-term in mind; this approach strengthens and prepares the NWT's labour force for opportunities moving forward. It is important that current Aboriginal employees continue to develop on their career paths. Industry-supported campaigns to educate and train Aboriginal employees can enhance the career progression of Aboriginal peoples.
- Education programs can be aligned with the largest gaps in trades and production occupations. This includes the high school level; subjects such as math and science are of particular importance to the development of a number of mining-related skills requirements.
- The NWT's mining industry has worked closely with territorial and local governments and training institutions to address workforce needs. For example, the Mine Training Society has been working with Aurora College and industry employers to ensure that all participants in the college's Underground Miner training program receive a six-month placement working at an operating mine. This type of initiative helps to ensure that graduates receive hands-on experience in the industry, enabling them to apply their knowledge and practice their new skills under the supervision of experienced miners.

Industry Churn and the Commuter Workforce

The NWT's mining industry currently depends on commuters to supplement the need for skilled workers. Anecdotal evidence from industry suggest that employers struggle to find NWT-resident talent with the skills and experience for the jobs that are available, and that youth who leave the territory for education opportunities often do not return. The impacts of a small pool of available workers, gaps in skills/education and the out-migration of the local talent pool have resulted in commuting workers as a viable option for employers.

The commuter workforce carries many costs for mining stakeholders. From the employers' perspective, the commuter workforce is expensive; from an economic and public perspective, a sizable commuter workforce does not contribute to building the local economy as commuters spend their earnings outside the NWT and pay taxes elsewhere. This can potentially compromise the development of infrastructure and the sustainability of local communities that support the NWT's mining activities.

Currently the commuter workforce is a reality for the NWT's mining industry. Retaining a large commuter workforce can be a challenge considering that commuting workers are flexible to explore their employment options in other regions of the country, including their own place of residence. The industry can mitigate attrition among the commuters through innovative employee engagement strategies and increasing opportunities for professional development. Efforts to accommodate the schedules and preferences of the commuter workforce can also improve their willingness to endure the high travel demands.

In the long-term, a well prepared and skilled NWT resident workforce can reduce pressures to find skilled workers in other jurisdictions. Increasing the readiness of the territorial population over time will not only enable the NWT's labour force to access new employment opportunities in mining but will also support the industry's sustainability. To address the talent gaps highlighted in this report, the long-term strategy must include all potential sources of labour and aim to attract new sources to the NWT. A diverse labour market is more stable in the face of changing external labour market conditions.



Immigration

Immigration will be an important source of new talent for the NWT's mining industry. Mining is a global industry and many immigrants coming to Canada have a wealth of industry-specific knowledge and experience. However, immigrants tend to gravitate towards large urban centres and many are not finding opportunities to utilize their skills sets to full potential. Proactive strategies to attract immigrant talent from large cities may encourage them to find opportunities in the mining industry.

Workforce Optimization

In addition to the strategies discussed above (i.e., expand the labour pool and increase the mining industry's share of it), industry employers need to focus on the best use of the workforce they have. Workforce optimization and strategic workforce planning ensure that the current workforce is functioning at its best, despite a tightening labour market. Workforce optimization analysis should not be confused with downsizing or other reactionary workforce adjustments. Rather, it is a joint analysis of workforce management, organizational design, technology, equipment, employee training and development, and business outcomes. The approach is meant to ensure strategic planning and continuous improvement to support the existing workforce.

Companies implement workforce optimization strategies for a number of different reasons.¹⁷ For example, while many companies use a human capital management tool to standardize company information, Cameco instead conducts a survey of department leaders that includes a workforce review and adjustment. This entails aggregating information about employees, identifying areas that are well or poorly staffed and prioritizing areas of need for talent-sourcing strategies. Once companies identify specific capacity challenges, they can make use of targeted recruiting, succession planning, deployment approaches and other workforce planning programs

¹⁷ Mining Industry Human Resources Council (MiHR), Strategic Workforce Planning, 2013

to reduce risks and develop a strong counter-cyclical strategy. This strategy is among the tactics that mining employers in the NWT can use to capture workforce information and make better decisions regarding their labour/capacity needs.

Over time, the ideal strategy for optimization can shift. For instance, fundamental changes in technology can have an impact on the mandatory skills of employees, causing the industry to refocus and identify which skills are necessary. In this case, educational institutions must adapt their programs to respond to industry needs. The main goal of optimization analysis and design is to ensure that challenges are identified early and that all stakeholders are coordinated in addressing issues.

Next Steps

This report is intended to provide a foundation for understanding the unique labour market conditions and outlook for the NWT's mineral exploration and mining industry. Findings and gap analysis can be used to support and develop targeted solutions in a coordinated and strategic manner. That said, this research has highlighted several issues that warrant further study, including:

- Aboriginal peoples are an important segment of the NWT's mining workforce force; however, they are generally employed in entry-level positions. A better understanding of the "glass ceiling" for career progression and education and skills development requirements of this important group will ensure that future vacancies in all occupation categories can be filled with local community workers.
- Another strategy is to support higher education in the North and to encourage Northerners to stay in, or return to, the NWT after graduation to work. This will help build a skilled and qualified northern workforce for the future.
- Review the social and economic impacts of a large commuter workforce on an ongoing basis.
- A broader understanding of the social and economic impacts of rapid industry growth and development on infrastructure, education and training, and communities—including a better understanding of the transition the industry will face in response to the changing characteristics and needs of the labour force.



- Effective approaches and initiatives to attract youth and engage new workers from the NWT population and from other provinces and countries. This includes improving information for career seekers through career awareness campaigns, mentoring, career path/education support and recruiting initiatives to attract more newcomers to the industry.
- A thorough catalogue and analysis of the supports and services available to encourage and retain the NWT's small and medium-sized enterprises that provide support to the exploration and mining industry.
- A detailed study and analysis of all sources of labour supply and barriers to inclusion in the industry, to ensure all sources of talent find opportunities in the industry. For example, women are a rapidly growing segment of the mining workforce. An opportunity exists to encourage women into trades and to ensure that barriers to inclusion are eliminated. The potential strategies to remove barriers are broader than expanding opportunities for education; they may include improving family support systems, daycare options and infrastructure to accommodate the needs of the individual.
- A detailed study on integration of immigrants into the industry and barriers to inclusion will help inform attraction campaigns and initiatives to attract Canada's new immigrants (e.g., foreign credential recognition, language training, multicultural assessments, etc).
- Revisit forecasts and gap analysis on a regular basis to adjust for rapidly changing conditions and track progress of initiatives to address the gaps.
- Effective approaches and initiatives to attract and engage workers from other provinces and countries—what career awareness, mentoring and recruiting initiatives are possible and how will they address labour shortages. This is in view of the fact that, presently, there are simply not enough educated and trained workers in the local workforce, especially for certain skilled occupations.

Summary

Labour market pressures such as the gaps identified in this report have the potential to derail future progress of the recent economic growth in the NWT's mining industry. The preparedness of stakeholders will determine the extent to which the NWT's mining industry is able to respond to labour market pressures. This includes adopting both short and long-term strategies to grow the talent pool; supporting the education, training and skills development of local workers to create a skilled northern workforce will help to reduce the reliance on the commuter workforce. A combination of approaches is important to ensure the future sustainability and success of the industry.



Appendices

SOURCE: THE MINE TRAINING SOCIETY

Appendix A

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. A flowchart depicting this methodology is provided in Figure A1.

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

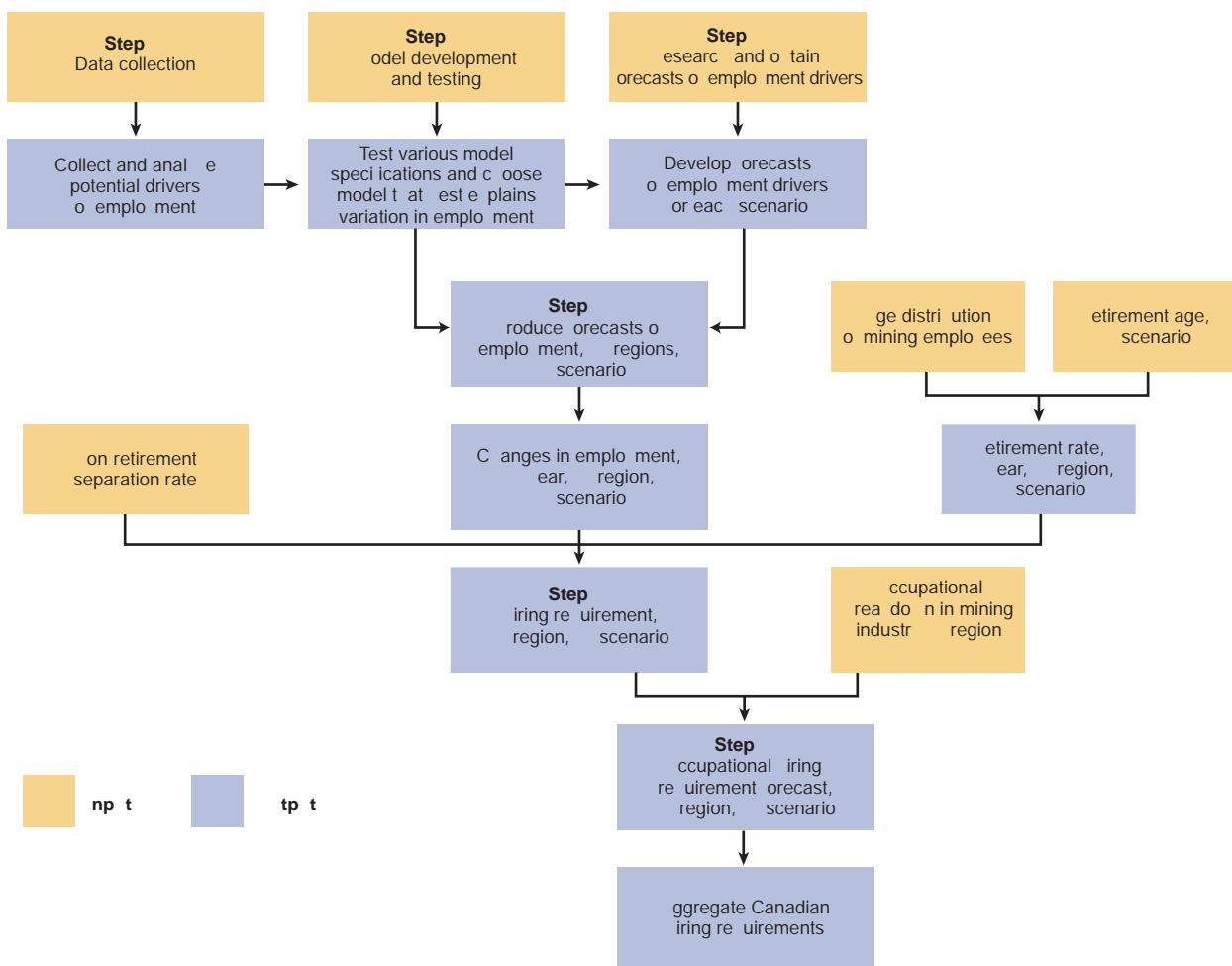
- Step 1: Collect and analyze data that may potentially explain changes in the number of jobs in each region.
- Step 2: Determine the driver(s) that explain the greatest level of variation in the number of jobs in each region by testing various model specifications through regression analysis.
- Step 3: Produce baseline, contractionary and expansionary forecasts for each driver determined in Step 2.
- Step 4: Combine Steps 2 and 3 to produce the forecasts for employment under baseline, contractionary and expansionary scenarios.
- Step 5: Produce forecasts of the total hiring requirements given the change in employment (determined in Step 4) and estimates of retirement and non-retirement separation rates.
- 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. MiHR's hiring-requirements forecasting model combines the effects of changes in commodity prices, growth of mining GDP, labour productivity, retirement rates, non-retirement separation rates and other economic variables to produce estimates of hiring requirements over the next 10 years.

MiHR partnered with the Government of the Northwest Territories (GNWT) and the Mine Training Society (MTS), and was supported by the Canadian Northern Economic Development Agency (CanNor), to produce this forecast analysis of the NWT's mining labour market. Mining employers in the region participated in an employer survey to provide inputs on the size and profile of their workforces. In January 2014, a consultation with mining employers and stakeholders also provided input on the prevailing human resources challenges facing the NWT's mining industry. Findings were used to verify and adjust employment estimates, validate forecasts and augment the assumptions for the forecast scenarios.

Figure A1

mp o ment n irin e irement orece tin o e



Source: Mining Industry Human Resources Council, 2014

Appendix B

MiHR's model of available talent for each occupation starts with the existing supply, adds in new entrants, and then subtracts people who leave. The model assumes three main sources of new entrants: school leavers, migrants and "others;" the latter group consists generally of people who switch occupations or re-enter the workforce after temporarily leaving it. The model also assumes three paths of departure from the workforce of a specific province or territory: moving to another province/territory or another country; retiring; and leaving for other reasons, which include transferring to another occupation, temporarily leaving the workforce, disability or death.

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. The census is the most 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 census data is that it is compiled only once every five years and the most recent census data available is from 2006. As such, the forecast for supply data begins in 2007. Where possible, more recent data (e.g., from the Labour Force Survey and the National Household survey) is incorporated into the forecast, to verify and validate the estimates from 2007 to 2011.

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 provincial 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 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 summed 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 has—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 Employment and Social Development Canada's (ESDC's) (formally Human Resources and Skills Development Canada) Canadian Occupational Projection System (COPS) model. NWT's share of international-migration flows, relative to the national average, is based on the relative strength of its labour market.

Net interprovincial migration is based on the balance of inflows and outflows of workers in a particular occupation in NWT, relative to the Canadian average. 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 to the province. According to modelling done by The Conference Board of Canada (CBoC), 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 census. To forecast immigration, the share of immigrants by occupation, relative to total immigration, is kept constant over the forecast period, and applied to the CBoC’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 CBoC’s existing forecasts for provincial immigration, this methodology incorporates a measure of the attractiveness of a region. The CBoC’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 NWT’s 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 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 for the NWT 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 and territory. Consistent with MiHR’s existing model, the retirement rate is assumed to be the same across all occupations. Retirement rates are forecasted by first estimating the probability that an individual will retire from the labour force in a given time period. This will depend on many factors, most notably the individual’s age and educational background. This behavioural estimation is then applied to the mining labour force, capturing its unique demographic characteristics.

Other Entrants

The last group of new entrants is the “other” 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 be already 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 for a particular province. In this manner, “other” entrants are precisely equal to and offset “other” leavers.

Appendix C

This appendix lists the North American Industry Classification Codes (NAICS) and National Occupational Classification (NOC) codes used throughout this report to define the mining industry. MiHR is engaged in ongoing, iterative research to include more NOC 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 (NOC). 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 system was developed by Statistics Canada and Employment and Social Development Canada (ESDC) (formally Human Resources and Skills Development Canada) 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 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 categories that pertain to only mining. People employed in occupations that are prevalent in mining also work in a variety of other industries. Together, the NAICS and NOC 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. Note that certain NAICS codes listed are not relevant to the NWT's mining industry. These are not included in the forecasts presented in this report. The list below describes the NAICS codes considered and underlines those that are relevant to the NWT's mining industry. 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 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 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 5413: Architectural, engineering and related services. This industry group comprises establishments primarily engaged in providing architectural, engineering and related services, surveying and mapping, laboratory and on-site testing, and specialized design services. Note that only a portion of this NAIC code relates to Geosciences, Surveying and Mapping, and Assay Laboratories.

Occupation Classification

MiHR uses National Occupation Classification (NOC) codes to classify occupations. Listed below are the 66 NOC codes that MiHR uses to define the occupations that are relevant to the mining industry. Note that the occupation titles listed below are those used in the Statistics Canada system. Note that certain NOC codes listed are not relevant to the NWT's mining industry and are therefore not included in the forecasts presented in this report.

An occupation can often have multiple titles and Statistics Canada offers a means to map or connect job titles back to the proper NOC code, found on the ESDC website (specifically the "Quick Search" box).¹⁸ 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

¹⁸ See <http://www5.hrsdc.gc.ca/NOC/English/NOC/2011/Welcome.aspx>

equipment; ripper operator – heavy equipment; shovel operator – heavy equipment; spreader operator – heavy equipment; stacker operator – heavy equipment. The list below flags (with an asterisk) the NOC codes that are relevant to the NWT's mining industry (54 NOC codes).

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NOC Code Title

0111	Financial managers*
0112	Human resources managers*
0211	Engineering managers*
0711	Construction managers*
0811	Primary production managers (except agriculture)*
1111	Financial auditors and accountants*
1112	Financial and investment analysts
1121	Specialists in human resources*
1241	Secretaries (except legal and medical)*
1441	Administrative clerks*
1473	Production clerks*
1475	Dispatchers and radio operators*
1476	Transportation route and crew schedulers*
2112	Chemists*
2113	Geologists, geochemists and geophysicists*
2115	Other professional occupations in physical sciences
2121	Biologists and related scientists*
2131	Civil engineers
2132	Mechanical engineers*
2133	Electrical and electronics engineers
2134	Chemical engineers
2141	Industrial and manufacturing engineers*
2142	Metallurgical and materials engineers*
2143	Mining engineers*
2144	Geological engineers*
2148	Other professional engineers*
2154	Land surveyors*
2211	Chemical technologists and technicians
2212	Geological and mineral technologists and technicians*
2221	Biological technologists and technicians*
2231	Civil engineering technologists and technicians
2232	Mechanical engineering technologists and technicians
2233	Industrial engineering and manufacturing technologists and technicians

¹⁹ See <http://www5.hrsdc.gc.ca/NOC/English/NOC/2011/Welcome.aspx>

- 2234 Construction estimators*
- 2241 Electrical and electronics engineering technologists and technicians
- 2253 Drafting technologists and technicians
- 2254 Land survey technologists and technicians*
- 2255 Mapping and related technologists and technicians*
- 2262 Engineering inspectors and regulatory officers*
- 2263 Inspectors in public and environmental health and occupational health and safety*
- 6242 Cooks*
- 7213 Contractors and supervisors, pipefitting trades
- 7216 Contractors and supervisors, mechanic trades*
- 7251 Plumbers*
- 7252 Steamfitters, pipefitters and sprinkler system installers*
- 7271 Carpenters*
- 7242 Industrial electricians*
- 7265 Welders and related machine operators*
- 7311 Construction millwrights and industrial mechanics (except textile)*
- 7312 Heavy-duty equipment mechanics*
- 7421 Heavy equipment operators (except crane)*
- 7371 Crane operators*
- 7372 Drillers and blasters - Surface mining, quarrying and construction*
- 7411 Truck drivers*
- 7452 Material handlers*
- 7611 Construction trades helpers and workers*
- 7612 Other trades helpers and workers*
- 8221 Supervisors, mining and quarrying*
- 8231 Underground production and development miners*
- 8411 Underground mine service and support workers*
- 8614 Mine workers*
- 9211 Supervisors, mineral and metal processing*
- 9231 Central control and process operators, mineral and metal processing*
- 9411 Machine operators, mineral and metal processing*
- 9415 Inspectors and testers, mineral and metal processing*
- 9611 Workers in mineral and metal processing*



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