CANADIAN MINERAL EXPLORATION HR OUTLOOK

PDAC
PROSPECTORS & DEVELOPERS ASSOCIATION OF CANADA

MiHR RHiM
MINING INDUSTRY HUMAN RESOURCES COUNCIL

Canada

Funded in part by the Government of Canada's Sectoral Initiatives Program.

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Published 2017

Front cover source: PDAC

Table of Contents

1. **Executive summary** **1**
   - MiHR's background 2
   - Acknowledgements 2
   - Report Overview 3
2. **Section One: Mineral Exploration Profile and Scope** **4**
   - Exploration Definition and Scope 4
   - Exploration and Commodity Prices 5
   - Employment Forecast for the Mineral Exploration Industry 8
3. **Survey Methodology** **9**
   - Online survey 9
   - Data analysis 10
   - Respondent definitions 10
4. **Respondent Profile** **11**
   - Employers 15
   - Exploration consultants/contractors 17
   - Workers 20
   - Educators 22
   - Students 24
   - Affiliates 27
5. **Section Two: Key Observations** **29**
   - Career Outlook 29
   - Opinion about working in exploration 31
   - Absence of a mid-career workforce 36
   - Higher female representation in exploration than mining 38
   - Career Awareness and Attraction Issues 43
   - Better Collaboration between Industry and Educational Institutions 44
6. **Conclusion** **46**
7. **References** **47**

List of Tables

Table 1: List of "other" organizational roles for affiliates who responded to the survey 28

List of Figures

Figure 1: Exploration expenditures by junior and major companies from 2012 to 2016 5

Figure 2: Growth in mineral exploration and deposit appraisal expenditure and the Commodity Price Index (Metals and Minerals) 6

Figure 3: 2015 regional distribution of global exploration budgets 6

Figure 4: Average share price for mining companies listed on the TSX compared to Bank of Canada commodity prices 7

Figure 5: Historical and forecasted employment in exploration (1997-2017) 8

Figure 6: Changes in spending and employment in the exploration sector (1998–2016) 8

Figure 7: Current position in the Canadian mineral exploration sector 12

Figure 8: Age distribution of the mining and Canadian labour force compared to survey demographics 12

Figure 9: Representation of select groups in the labour force compared to survey demographics 13

Figure 10: Education level of survey respondents (workers and contractors) compared to the labour force 13

Figure 11: Permanent residence of respondents 14

Figure 12: Primary area of study of the mineral exploration respondents 14

Figure 13: Type of organization as indicated by respondents 15

Figure 14: Exploration employers, by organization type and location 15

Figure 15: Survey responses to “At the height of this year’s mineral exploration do you anticipate that your workforce will…” 16

Figure 16: Employer responses to “Thinking of the number of employees you expect to be working in mineral exploration at the height of the mineral exploration season this year, over the next couple of years, do you anticipate your workforce will…” 16

Figure 17: Type of company where contractors are currently working on mineral exploration projects 17

Figure 18: Location of projects that contractors surveyed spent most of their time working in and the type of work they were conducting 18

Figure 19: Reason for leaving former exploration company employment as indicated by respondents who are current contractors 19

Figure 20: Responses on what former mineral exploration company employees did as a result of leaving their previous organization 19

Figure 21: What contractors/consultants see themselves doing in 5 years 20

Figure 22: Type of employment vs. type of employer for workers who responded to the mineral exploration survey 20

Figure 23: Type of work vs. location of work for exploration workers surveyed 21

Figure 24: What workers surveyed see themselves doing in five years 22

Figure 25: Location and type of educational institution where educator respondents work 22

Figure 26: Role of educators who responded to the mineral exploration survey 23

Figure 27: The type of mineral exploration training and education provided by educators who responded to the survey 23

Figure 28: Work-integrated learning offered by educational institutions surveyed 24

Figure 29: Location and type of institution that student respondents are currently attending 24

Figure 30: Program of study for the students that responded to the survey 25

Figure 31: Degree being pursued by students that responded to the survey 25

Figure 32: Types of work-integrated learning related to the program that students are enrolled in (based on respondents) 26

Figure 33: Responses from students as to what they see themselves doing in five years 26

Figure 34: Percentage of time affiliates who responded to the survey spend working in the exploration industry or on exploration projects 27

Figure 35: Roles of mineral exploration affiliates who responded to the survey 27

Figure 36: Career outlook for the mineral exploration sector over the next five years 30

Figure 37: Do 2017 graduates have employment arranged after they graduate from their current program? 30

Figure 38: How each group of respondents ranked aspects of working in the mineral exploration industry 31

Figure 39: Distribution of permanent and non-permanent jobs for various industries in Canada 34

Figure 40: Turnover rate from organizations surveyed 35

Figure 41: Employer's response to "How many of your organization's workforce travel more than 500 km to remote worksites?" 35

Figure 42: Age of respondents in the workforce (includes workers, affiliates and contractors; does not include students and educators) 36

Figure 43: Geoscience enrolment in Canada 37

Figure 44: Length of time it took respondents to first find employment in the mining or exploration sector after they had left school 38

Figure 45: Number of male and female respondents by job category 39

Figure 46: Age of respondents for workers and contractors 40

Figure 47: Age distribution of male and female respondents 40

Figure 48: Rate of female representation in the workforce for different industries compared to the survey response rate and headcount data provided by employers 41

Figure 49: Proportion of women in senior leadership roles (responses from employers surveyed) 42

Figure 50: When respondents first learned about careers in exploration 43

Figure 51: Educators' impression of how important it is for students to have the opportunity to participate in work-integrated learning and the ease of getting industry to offer these programs 44

Figure 52: Responses from educators when asked "Thinking about the human resources needs of the mining exploration sector, please rate the priority that should be given to each of the following" 45

Figure 53: Level of preparedness after leaving school compared to the type of work experience completed before graduation 45

EXECUTIVE SUMMARY

Source: PDAC

Mineral exploration is the first stage of the mining process and requires collaboration among multiple stakeholders to be successful. The Mining Industry Human Resources Council (MiHR) and the Prospectors and Developers Association of Canada (PDAC) have joined together to produce this report on the status of the Canadian mineral exploration sector. The goal of this research is to help mining stakeholders identify and understand the human resource and labour market challenges facing the exploration sector.

Unlike other segments of the mining sector, the exploration sector is not covered by a nationally recognized industry classification, nor is there a specific collection of occupations that can be used to define the scope of the sector.

By developing and deploying a robust research tool — a survey of individuals and organizations working in exploration — MiHR and PDAC have been able to fill a gap in labour market information, allowing for a more refined and accurate reflection of the labour market realities and challenges facing mineral exploration in Canada.

The primary objectives for this project were to:

- enhance the labour market information available to mineral exploration stakeholders;
- assess a variety of labour supply and demand factors related to workers involved in mineral exploration;
- identify the short- and long-term HR challenges and opportunities facing different groups in the mineral exploration segment of the industry; and
- serve as the basis for developing an industry strategy and action plan to address key HR issues.

Six categories of people connected with the exploration industry were included in our research: employers, contractors, workers, educators, students and affiliates. A total of 397 completed survey responses were received. The results of this survey reveal several overarching themes that cut across all groups associated with exploration.

Key themes include:

- the indication that students have the most negative career outlook;
- the absence of a mid-career workforce;
- higher female representation in exploration than mining;
- challenges associated with career awareness and attraction; and
- the need for better collaboration between industry and educational institutions.

The research also provides insight into perceptions of the industry workforce on various aspects of working in exploration (field work, travel, job security, etc.). These insights offer a basis for developing new, and refining existing programs targeted towards increasing participation and retaining workers in the exploration labour market.

Source: Callinex Mines Inc.

MiHR's background

One of MiHR's strategic objectives is to research, analyze, forecast and disseminate labour market, human resources (HR) and other human capital information relevant to the minerals and metals sector (e.g. labour market information, sector studies, occupational supply and demand forecasts, and relevant research focused on HR issues). To meet this objective MiHR is engaged in several initiatives to improve the quality and availability of labour market information to industry stakeholders. The Canadian Mineral Exploration Survey has added to this body of knowledge. Specifically, this report analyzes labour market issues and the short- and long-term human resource challenges facing the Canadian mineral exploration sector.

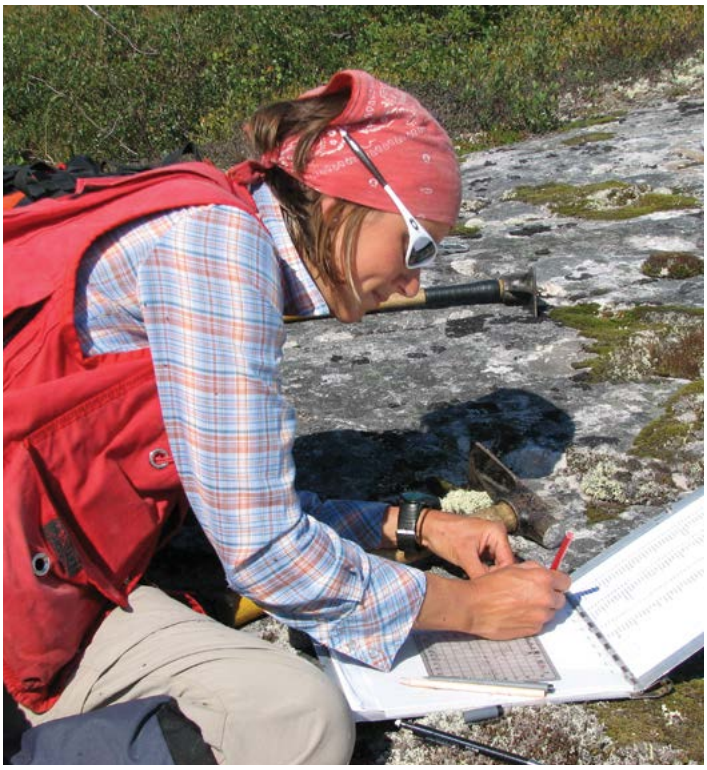
Acknowledgements

MiHR partnered with PDAC to develop this research initiative. Prairie Research Associates, on behalf of MiHR and PDAC, helped with the survey questions and design.

MiHR and PDAC are grateful to all of the individuals and organizations in the Canadian mineral exploration sector who contributed their resources, knowledge and insights to this study and report.

MiHR wishes to thank all research participants for contributing their valuable time and input in filling out the survey. We are particularly indebted to the project steering committee for their hard work, guidance and insights.

- **Marc Gasparotto,** Student Program Coordinator, PDAC (partner)
- **Lisa McDonald,** Chief Operations Officer, PDAC (partner)
- **Gavin Dirom,** President and CEO, Association for Mineral Exploration British Columbia
- **Oliver Bonham,** CEO, Geoscientists Canada
- **Tyla Hay,** HR Manager, SRK Consulting
- **Mike Villeneuve,** Acting Director, Central Canada Division, Geological Survey of Canada
- **Louise Laverdure,** Acting Director, Central and Northern Canada Branch, Geological Survey of Canada
- **Bob Valliant,** CEO and Director, TRI Origin Exploration
- **Attila Pentek,** Senior Geologist, Wallbridge Mining Company
- **Mary Louise Hill,** Professor, Lakehead University



Source: PDAC

Source: Selwyn Resources Ltd.

Report Overview

This research investigates the particular experiences and perspectives of the wide variety of people working in Canada's mineral exploration sector. It offers a new look at many topics in Canada's mineral exploration sector from a broad and national lens, including topics such as women in exploration, work-integrated learning and career awareness. These insights will support industry stakeholders in creating strategies to increase the sector's ability to engage new pools of talent in mineral exploration work. It adds to MiHR's body of research available to the mining industry on the many facets of the labour market and on the related short- and long-term human resource challenges. In alignment with our core value of collaboration, MiHR partnered with PDAC, which represents the interests of the Canadian mineral exploration and development industry, and also has a strong interest in the sector's labour market issues.

The purpose of this Canadian Mineral Exploration Survey is to provide reliable, relevant and timely labour market information to support strategic workforce planning, and to stimulate a proactive approach to addressing the HR challenges facing the mineral exploration sector.

The primary objectives for this project were to:

- enhance the labour market information available to mineral exploration stakeholders;
- assess a variety of labour supply and demand factors related to workers involved in mineral exploration;
- identify the short- and long-term HR challenges and opportunities facing different groups in the mineral exploration segment of the industry; and
- serve as the basis for developing an industry strategy and action plan to address key HR issues.

There are two main sections to this report. Section One provides a brief introduction to the mineral exploration industry, as well as demographic profiles of the six groups of respondents. Section Two contains key observations derived from responses to survey questions, where overarching themes were observed among the different groups.

SECTION ONE: MINERAL EXPLORATION PROFILE AND SCOPE

Source: PDAC

Exploration Definition and Scope

Mineral exploration is the first stage of the mining cycle. It is the process through which information is gathered to assess the mineral potential of a given area. Mineral exploration generally starts when thorough geological modelling is used to identify a target area as having the potential for an economically viable deposit. Five general stages are involved in mineral exploration. These stages are described below, along with examples of the occupational groups responsible for work in each stage.

1. **Planning and mineral assessment:** The first phase involves identification and analysis of potential target areas using publicly available information from local, provincial and federal governments, as well as information made public by companies who have worked in the area. (e.g. geologists, prospectors).
2. **Staking the claim:** Once a target area has been identified, it needs to be staked, if it is on Crown land, or the

exploration rights need to be purchased from the current claim holder (e.g. geologists, consultants, prospectors).

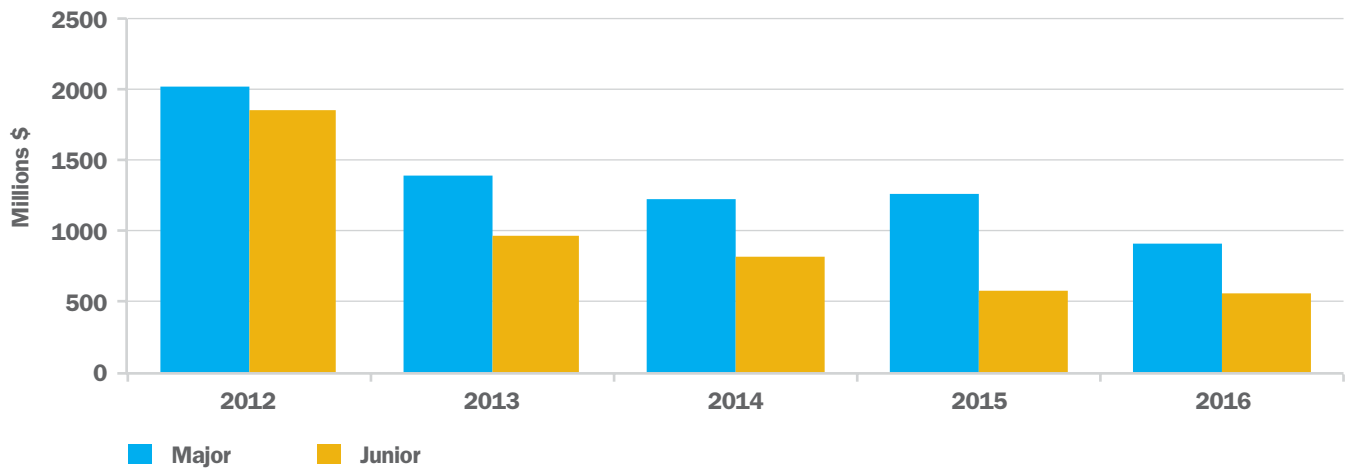
3. **Reconnaissance:** The reconnaissance stage involves prospecting, mapping, sampling, and geophysical and geochemical surveys to help identify geological targets indicative of a mineral deposit (e.g. geologists, geochemists, prospectors, geophysicists).

4. **Advanced exploration:** Once a target has been identified, further work (e.g. drilling, trenching, sampling, assaying) needs to be done to determine the economic viability of the deposit (e.g. geologists, drillers, geotechnicians).

5. **Economic evaluation:** Once the size and quality of the ore deposit has been determined (through reserve and resource calculations), a feasibility study needs to be conducted to see if mining the deposit is economically viable, given operating, construction, rehabilitation, transport and other costs (e.g. resource geologists, geological engineers).

The mineral exploration industry consists of numerous different organizations that come together to discover potential areas for economical mineral resource development. Companies in mineral exploration vary greatly in size — ranging from junior companies consisting of a couple of workers to entire exploration departments of major mining companies. Traditionally, junior companies have no operating revenues and depend solely on equity financing and investors to cover the cost of exploration. Although junior companies make up a higher proportion of Canada's exploration sector in terms of numbers, major companies tend to invest more heavily in exploration (Figure 1).

Figure 1: Exploration expenditures by junior and major companies from 2012 to 2016



Source: Natural Resources Canada, 2016

Exploration and Commodity Prices

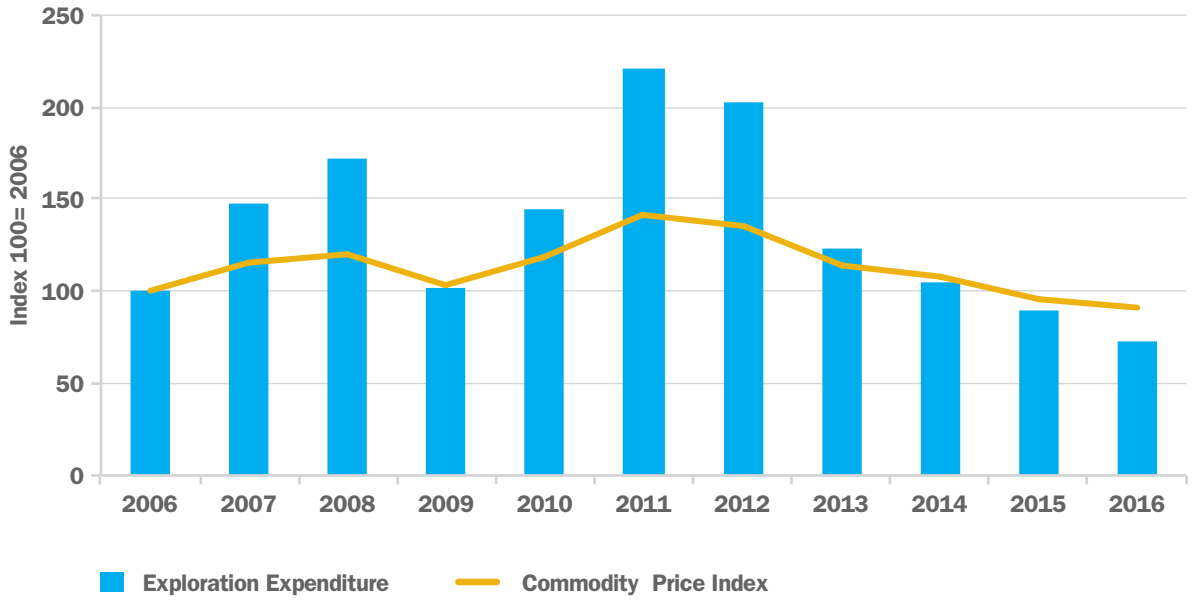
The last three years have been especially volatile for the resource sector (Figure 2). This volatility is associated with a sharp decline in oil prices coupled with waning Chinese demand and political uncertainty in the Middle East, resulting in stalled investment in the mineral exploration sector. The recent rebound in commodity prices is revitalising for both the mining and exploration sectors. According to the World Bank, the world economy is expected to grow by 2.7 per cent in 2017.

The exploration sector is sensitive to commodity prices, where price movement can induce boom and bust periods in exploration. The first quarter of 2017 witnessed the rebound of commodity prices indicative of a renewed interest in mining and exploration activities. The World Bank energy price index increased by 6 per cent in the first quarter of 2017 and correspondingly, metal prices surged by 10 per cent (World Bank, 2017).

The current increase in commodity prices is predominantly driven by strong demand associated with investment in China's infrastructure and manufacturing sectors.

The exploration industry is largely dependent on investors, where strong investor confidence translates into larger investments and bullish capital markets, which fuel growth in the industry. As noted, the exploration industry is characterized by highly volatile conditions and this volatility is a fundamental systemic risk associated with investment in exploration.

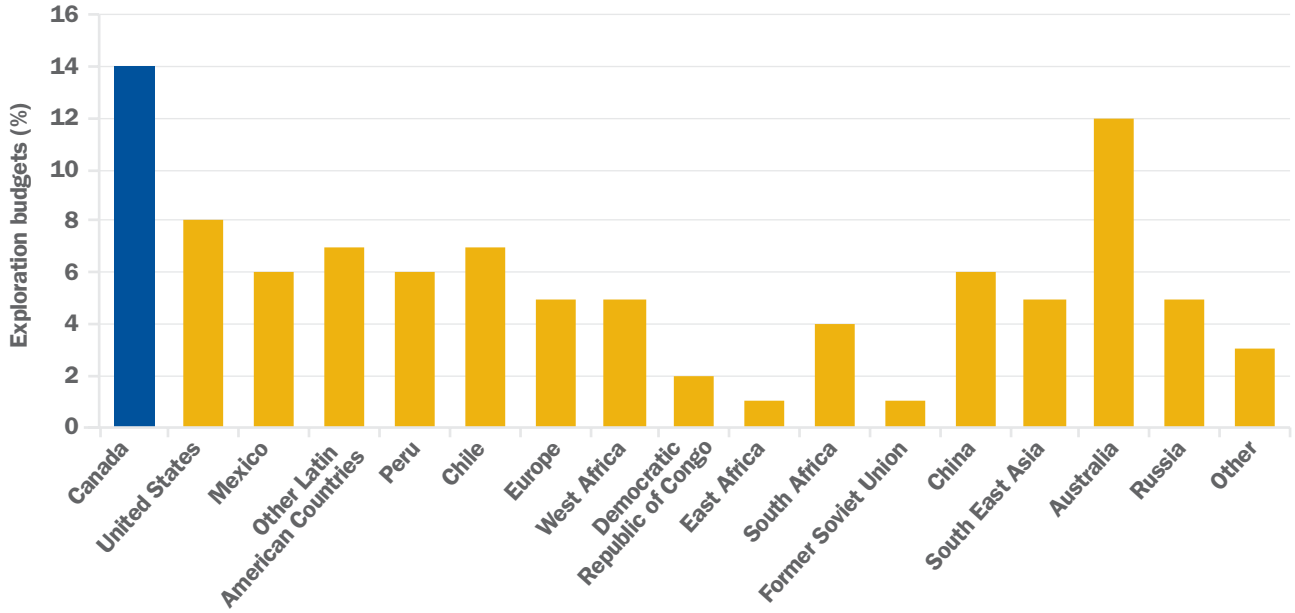
Figure 2: Growth in mineral exploration and deposit appraisal expenditure and the Commodity Price Index (Metals and Minerals)



Sources: Bank of Canada, 2017; NRCAN, 2017

Financial and environmental regulatory frameworks, fiscal policy, infrastructure to deliver goods, ease of conducting business, and government subsidies are some of the variables in attracting capital. A robust exploration sector, supportive mining-related industries, skilled labour, politically stable government and an investor-friendly environment have all contributed to high investment in Canadian mineral exploration (Natural Resources Canada, 2016). SNL Metals and Mining (2016) ranked Canada the world's top destination for non-ferrous exploration spending in 2015, attracting 14 per cent of worldwide expenditures, concentrated predominantly in Ontario and Québec.

Figure 3: 2015 regional distribution of global exploration budgets

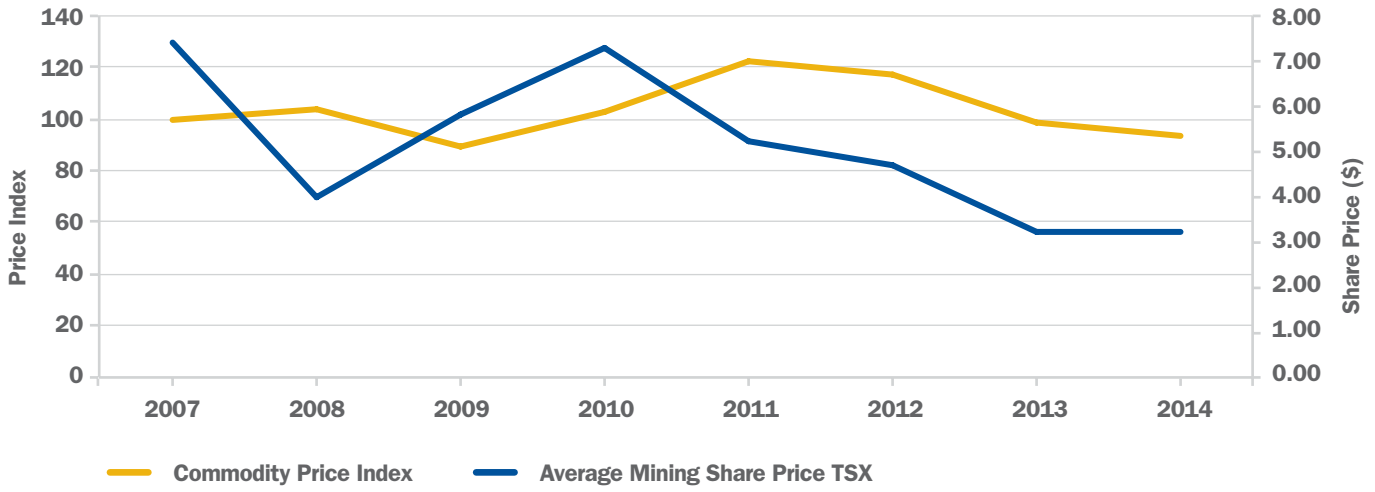


Source: SNL Metals and Mining, 2016

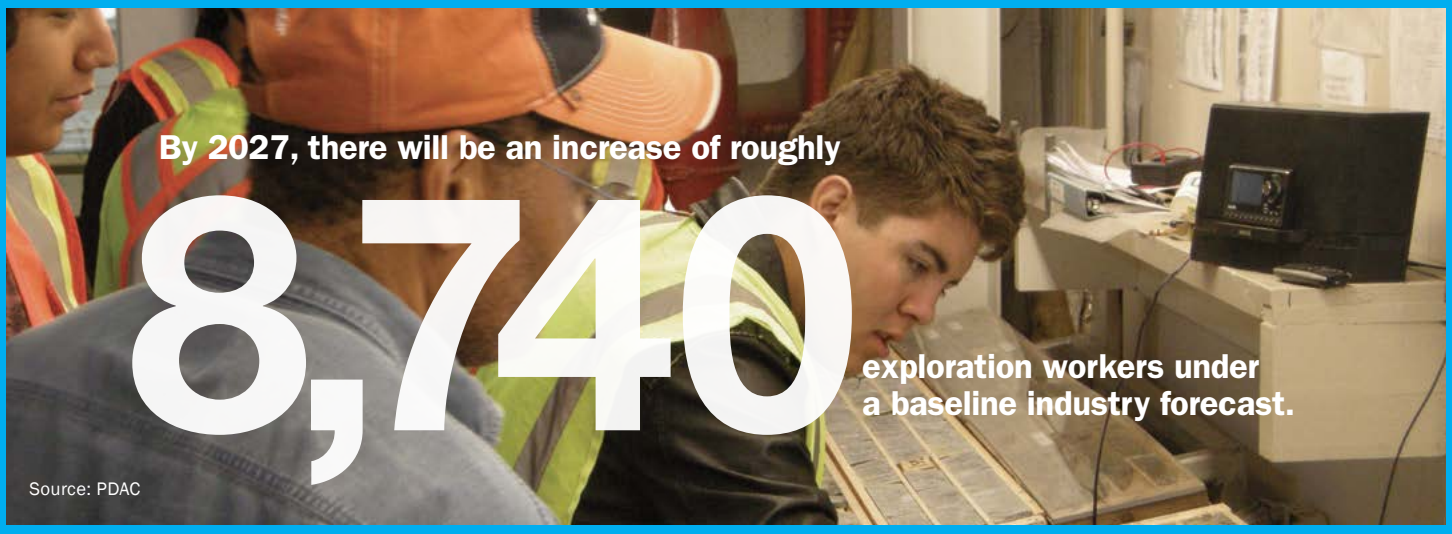
The Canadian government has demonstrated a commitment to boosting growth in the exploration sector. In the 2017 budget, the federal government announced a one-year renewal of the 15 per cent Mineral Exploration Tax Credit (METC), which aids junior exploration companies in raising capital. This tax credit is layered upon the offering of flow-through shares[1]. It is estimated that this measure will result in an expected net tax reduction for exploration investors of approximately $30 million over the period from 2017 to 2019. This tax credit is aimed at helping junior companies and will play an integral role in attracting investment to the Canadian exploration sector.

Toronto is the largest financial hub for the global mining industry. As of April 2017, over 1,200 mining companies were listed on the Toronto Stock Exchange (TSX) and the TSX Venture Exchange (TSXV). In 2016, 57 per cent of global mining financing was done on the TSX and TSXV. The ability of exploration companies to raise capital in equity markets is dependent on investor confidence. In 2011, the decline in commodity prices (6 per cent) eroded investors' confidence, resulting in a declining average share price for TSX-listed companies between 2010 and 2014 (Figure 4).

Figure 4: Average share price for mining companies listed on the TSX compared to Bank of Canada commodity prices



Sources: TMX Group, 2017; PDAC, 2017 and Bank of Canada, 2017



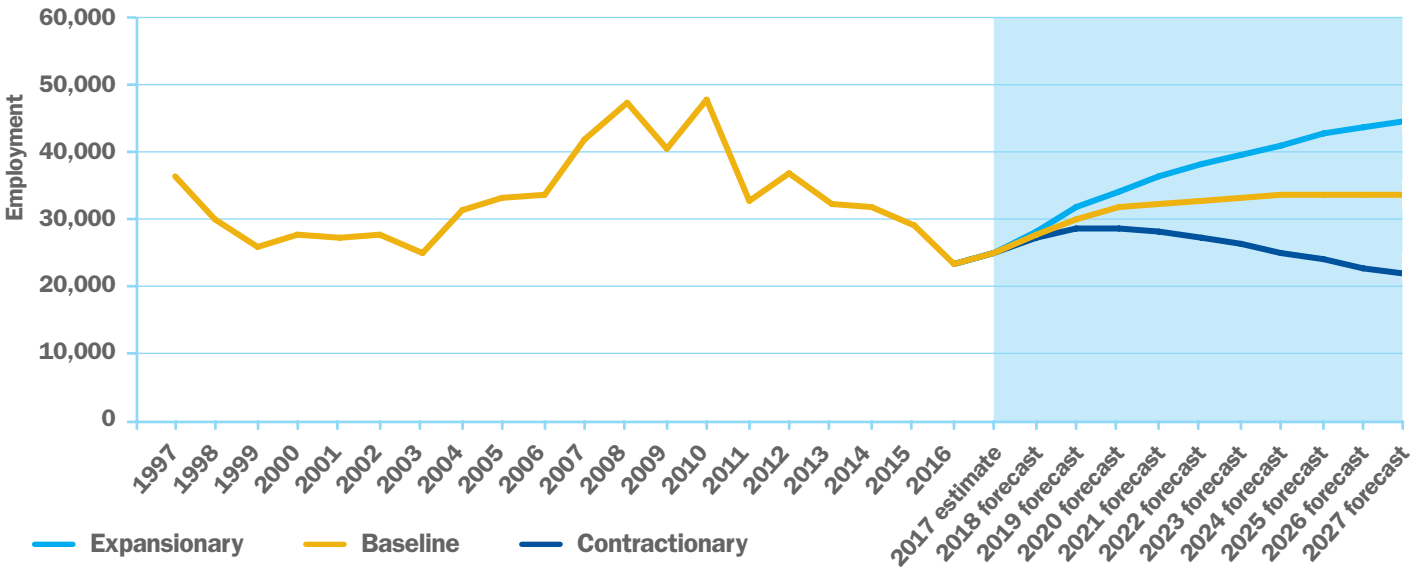
[1]*Flow-through shares are an incentive provided to the individuals who invest in early-stage exploration allowing resource companies to transfer expenses related to their Canadian exploration activities to investors, who can deduct the expenses in calculating their taxable income.*

Employment Forecast for the Mineral Exploration Industry

MiHR estimates exploration sector employment for 2017 at 25,000 workers. MiHR's employment forecast for the 10-year horizon from 2018 to 2027 projects an increase of roughly 8,740 workers (or 35 per cent) under a baseline industry forecast (Figure 5). These are estimated figures because there is no clearly defined North American Industry Classification System (NAICS) code for the mineral exploration sector and few, if any, public labour market information (LMI) sources that report on the sector separately. The intent of this survey was to gain a better understanding of the exploration industry in its entirety, and the occupations that make up mineral exploration. The results of this survey are a first attempt to characterize the industry, and although the data presented here likely over-represents the professional and technical occupations, it is useful in understanding some of the broad issues that affect all workers in mineral exploration.

Figure 6 demonstrates that exploration employment is highly sensitive to commodity prices and exploration spending. This highlights the challenge for the sector in maintaining a sustainable workforce when faced with economic uncertainty and highly volatile markets.

Figure 5: Historical and forecasted employment in exploration (1997-2017)



Source: MiHR National Report, 2017

Figure 6: Changes in spending and employment in the exploration sector (1998–2016)

Source: MiHR National Report, 2017; Natural Resources Canada, 2017; Statistics Canada, System of National Accounts, 2017

SURVEY METHODOLOGY

Source: PDAC

Online survey

A comprehensive online survey was made available to the Canadian mineral exploration industry's stakeholders, including employers, employees, contractors, students, educators and affiliates.

The online survey, entitled the Canadian Mineral Exploration Survey, was available online from April 12 to June 5, 2017. The survey was available in both English and French.

The sample respondents were defined by the following criteria:

- Currently or recently (within the last five years) working in Canada's mineral exploration sector, including those working as independent contractors, students, affiliates and educators — or employing people who work in the mineral exploration sector; and

- Willing to provide confirmation of informed consent, by agreeing to a consent confirmation request at the start of the survey. Detailed information was available online for the respondent to review prior to completing the survey.

To achieve an acceptable response rate, several methods of distributing the survey were utilized, including a variety of media and outreach approaches, and a collective cascading effort to raise awareness and distribute the survey link through networks.

Data analysis

The exploration survey had a total of 397 completed survey responses. All data used in this report was derived from completed survey response data; incomplete data was discarded.

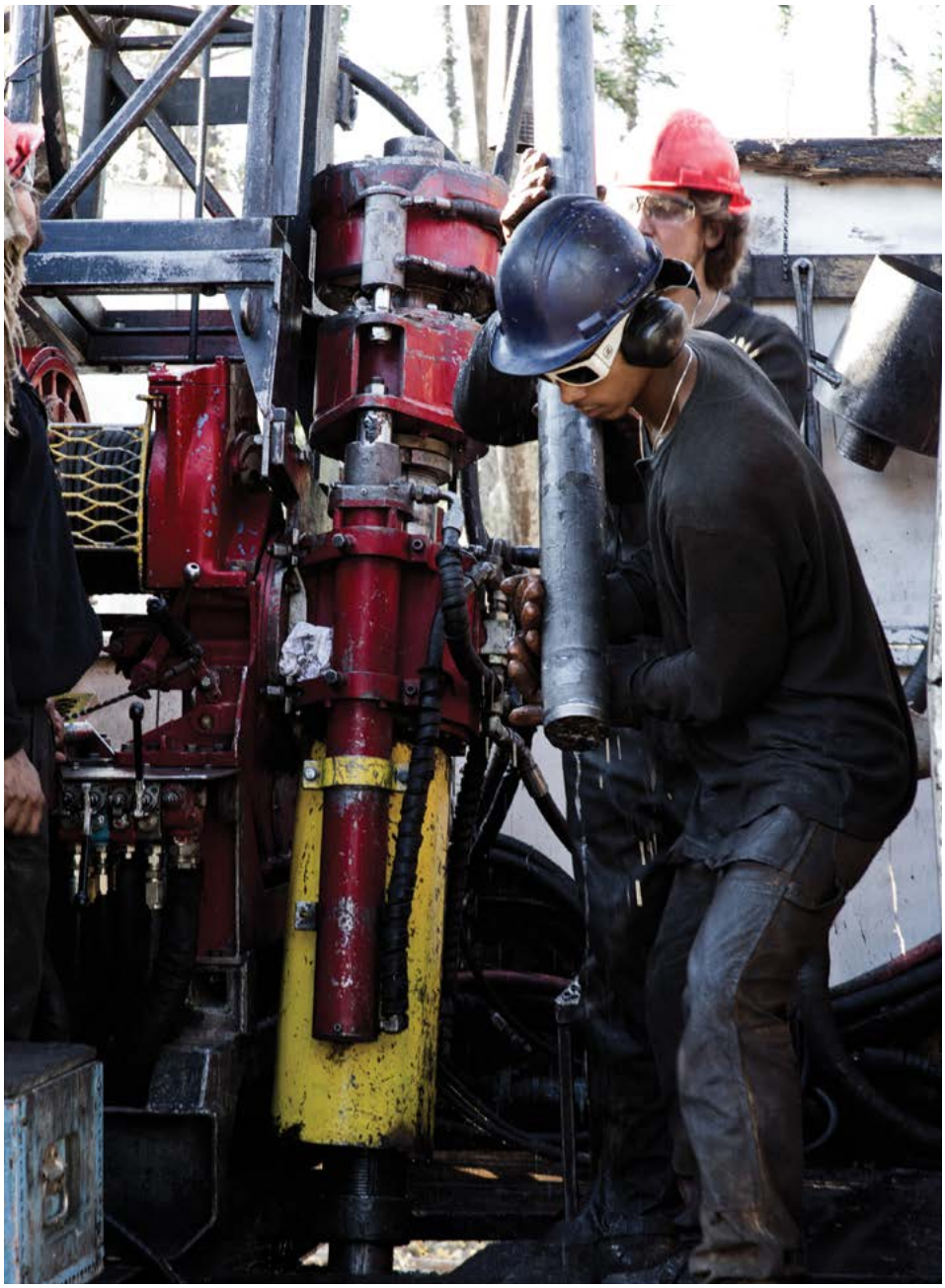
Respondent definitions

This research was focused on six different groups involved in the mineral exploration sector (1) employers (2) contractors (3) workers (4) educators (5) students and (6) affiliates.

1. **Exploration employer:** Responsible for hiring exploration workers in their organization (e.g. has human resource responsibilities for hiring workers in a mining or exploration company, or in another type of organization, such as a geological survey department or government regulator).

2. **Exploration consultant/contractor/prospector:** Self-employed, having worked in the mineral exploration sector for their own company or on contract with, or as a consultant to, a mineral exploration employer (e.g. might do prospecting on their own or as a consultant to another company).

3. **Exploration worker:** An employee; has worked as an employee; or is a recent graduate seeking employment from an organization in the Canadian mineral exploration sector.



Source: PDAC

4. **Exploration educator:** Provides post-secondary mineral exploration education and training.

5. **Exploration student:** Is currently a post-secondary student in a mineral exploration-focused program or course.

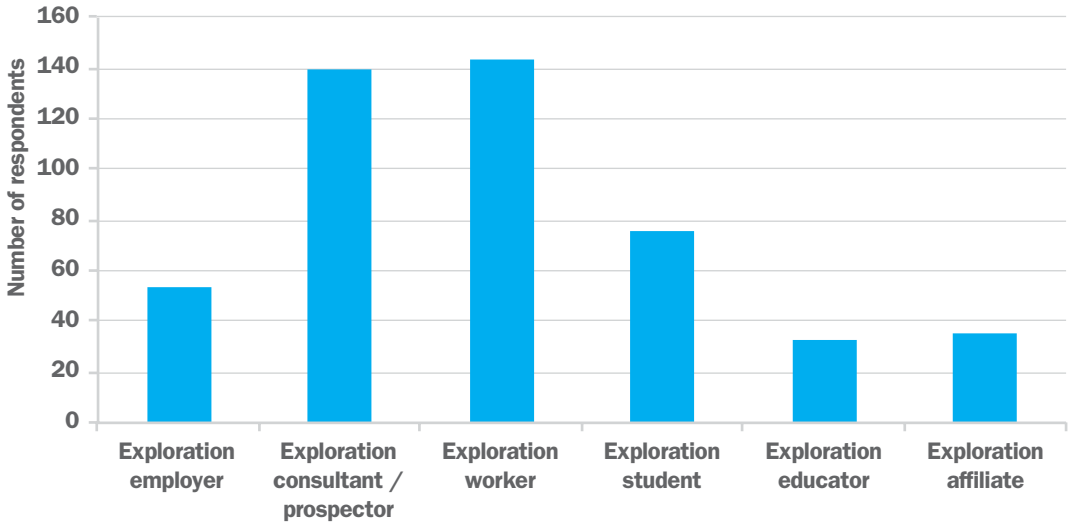
6. **Exploration affiliated/support services:** Works for or with an organization that is affiliated with the mineral exploration industry, but does not conduct primary exploration activities (e.g. an association, legal or accounting firm, or other types of organizations that do not generally have employees working on-site in the field).

RESPONDENT PROFILE

Source: PDAC

Respondents were asked to self-identify which of the six major groups best described their current (or most recent) position in the mineral exploration sector, allowing selection of up to two categories. The number of respondents for each group is shown in Figure 7.

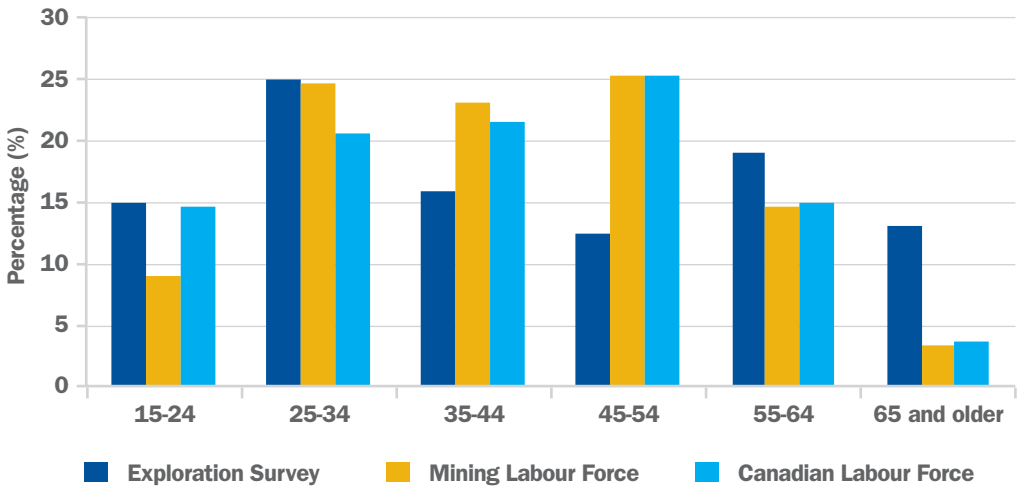
Figure 7: Current position in the Canadian mineral exploration sector



Source: MiHR Exploration Survey, 2017

Analysis of respondent age distribution showed that both younger (ages 15–34) and older (age 55 and over) groups were over-represented and the middle-age range (35–54) was significantly under-represented, when compared to both the mining labour force and the Canadian labour force (Figure 8). The lower numbers of mid-career workers in the survey sample are consistent with observations of the exploration labour market by numerous organizations, including the Canadian Federation of Earth Sciences (CFES, 2008).

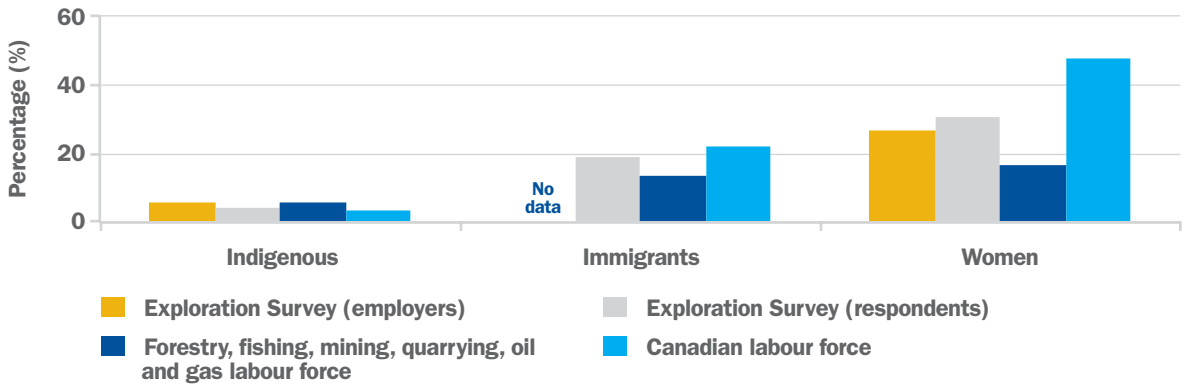
Figure 8: Age distribution of the mining and Canadian labour force compared to survey demographics



Sources: Labour Force Survey, 2017; MiHR Exploration Survey, 2017

The individual respondents (all groups but employers) were asked to indicate if they self-identified as an under-represented labour source (i.e. Indigenous, immigrant or woman) and employers were asked to identify the proportion of their workforce that were either women or Indigenous. The current sample and subsequent reporting relies on a much higher proportion of women and immigrants than are represented in the total mining industry labour force. However, these percentages are still below the average for the Canadian labour force (Figure 9). Indigenous representation is similar between this sample and the mining industry labour force, and both are known to be slightly higher than representation in the Canadian labour force.

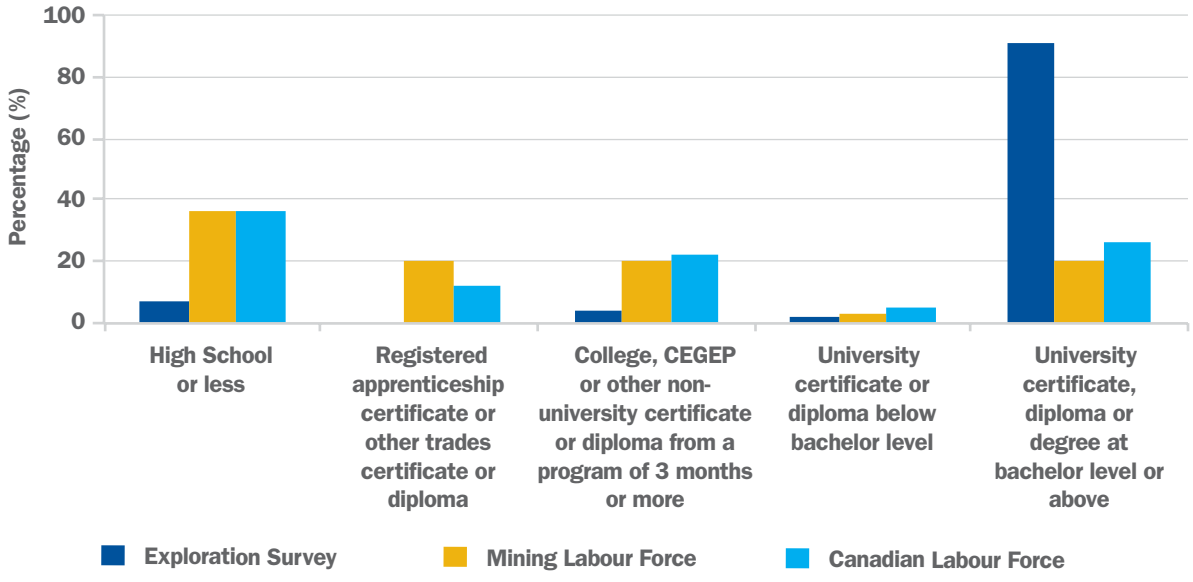
Figure 9: Representation of select groups in the labour force compared to survey demographics



Statistics Canada Labour Force Survey 2017

Over 90 per cent of respondents indicated that they have a Bachelor's degree or higher, a rate that is over four times that of the mining labour force, and more than three times the rate in the Canadian labour force (Figure 10). The higher level of education in the exploration industry has been observed previously by MiHR and PDAC (2011), although it could also be attributed to a survey bias related to the distribution of the survey through numerous professional organizations. Previous research has indicated that women and immigrants who work in the mining industry have a higher level of education than the overall mining labour force (MiHR, 2016).

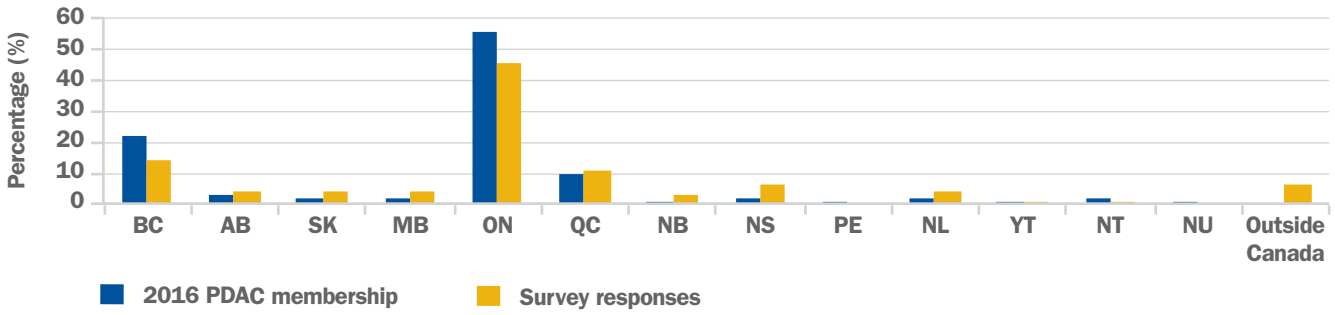
Figure 10: Education level of survey respondents (workers and contractors) compared to the labour force



Statistics Canada Labour Force Survey 2017

The majority (>45 per cent) of respondents permanently reside in Ontario, indicating a geographical bias in the survey results. The geographical distribution of survey respondents reflects PDAC's membership demographics (Figure 11).

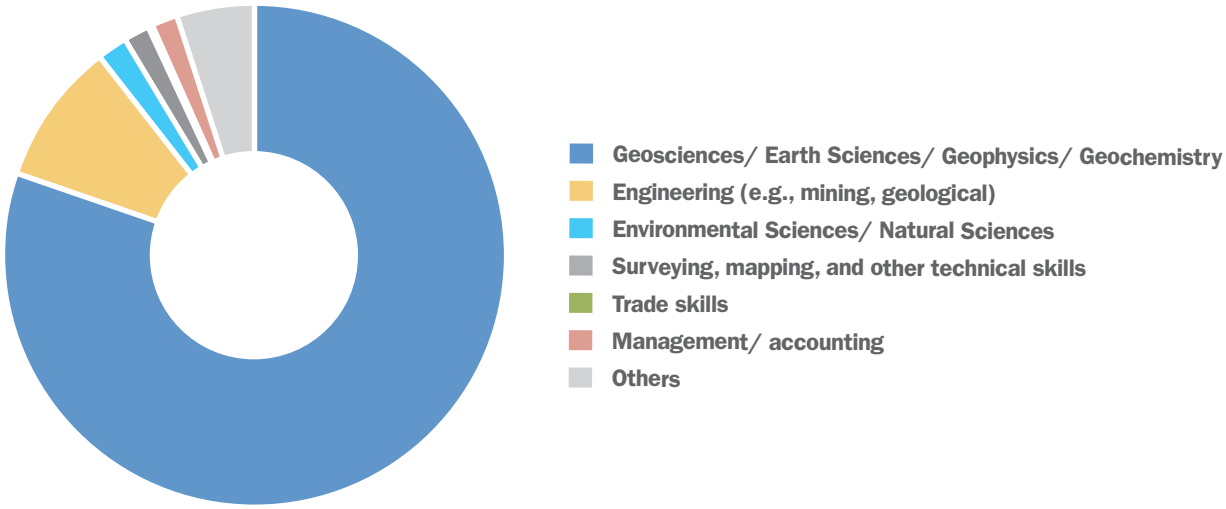
Figure 11: Permanent residence of respondents



Sources: PDAC annual report, 2016; MiHR Exploration Survey 2017

Most (>80 per cent) of the respondents reported a primary area of study in the geoscience/earth sciences/geophysics/ geochemistry fields (Figure 12). The large representation from geosciences/earth sciences/geophysics/geochemistry may reflect a greater survey penetration in this field than in other areas of exploration.

Figure 12: Primary area of study of the mineral exploration respondents

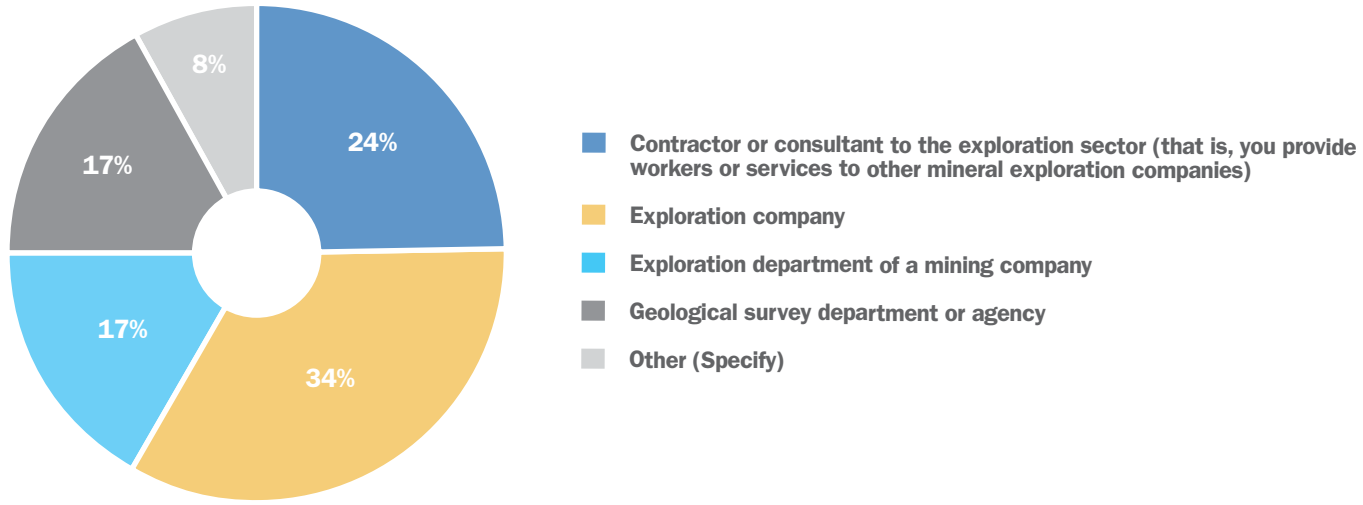


Source: MiHR Exploration Survey, 2017

Employers

The Canadian mineral exploration industry requires the input of many different organizations; contractors or consulting firms, exploration companies, mining companies, and geological survey departments or agencies all play a vital role in this industry. A total of 53 employers responded to the survey and were asked to identify the type of organization that they represented, with the majority (34 per cent) representing exploration companies (Figure 13).

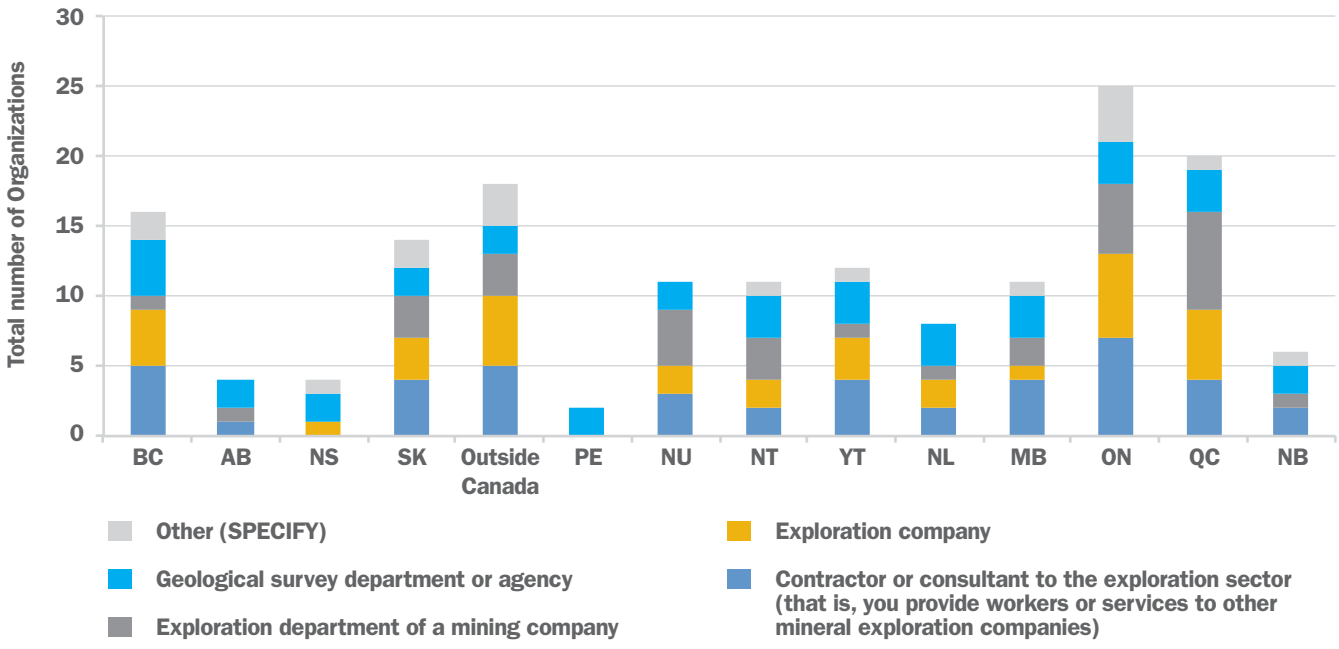
Figure 13: Type of organization as indicated by respondents



Source: MiHR Exploration Survey, 2017

The survey responses were derived from employers who work in all provinces and territories (Figure 14). It should be noted that there are no mineral deposits in Prince Edward Island and that the only employer representation is from a geological survey organization. The number of employers working in each province is reflective of the investment in exploration companies across Canada. Almost 35 per cent of employers indicated that they have ongoing exploration projects in multiple locations across Canada, with 22 per cent operating globally.

Figure 14: Exploration employers, by organization type and location

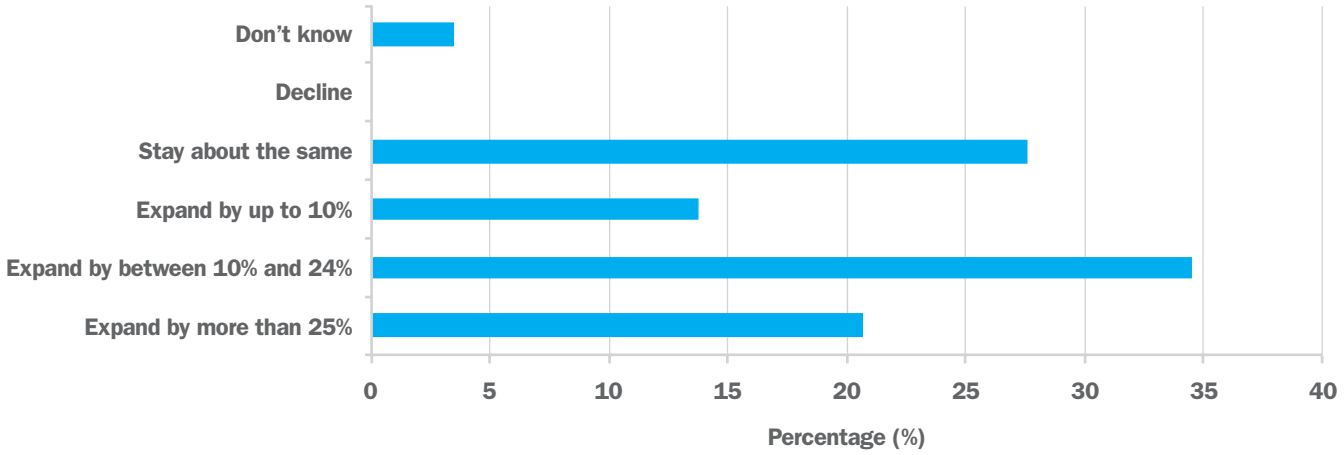


Source: MiHR Exploration Survey, 2017

Commodity prices and exploration expenditures generally move in tandem with each other. Previous research from the World Bank (2009) indicated that there is a lag between an increase in commodity prices and investment in exploration/mining companies. Given the current optimistic environment associated with recovering commodity prices, it is plausible to assume that the mining and exploration sectors will be entering a period of growth. The 2017 exploration survey attempted to take the pulse of the exploration industry by asking employers questions related to future hiring expectations.

An overwhelming majority of the respondents (69 per cent) expected the size of their workforce to expand this year (Figure 15): 34 per cent of respondents expect an increase of between 10 and 24 per cent, and 21 per cent expect a workforce increase of more than 25 per cent. These results reflect the general sentiments of employers surveyed and show optimism about the current conditions.

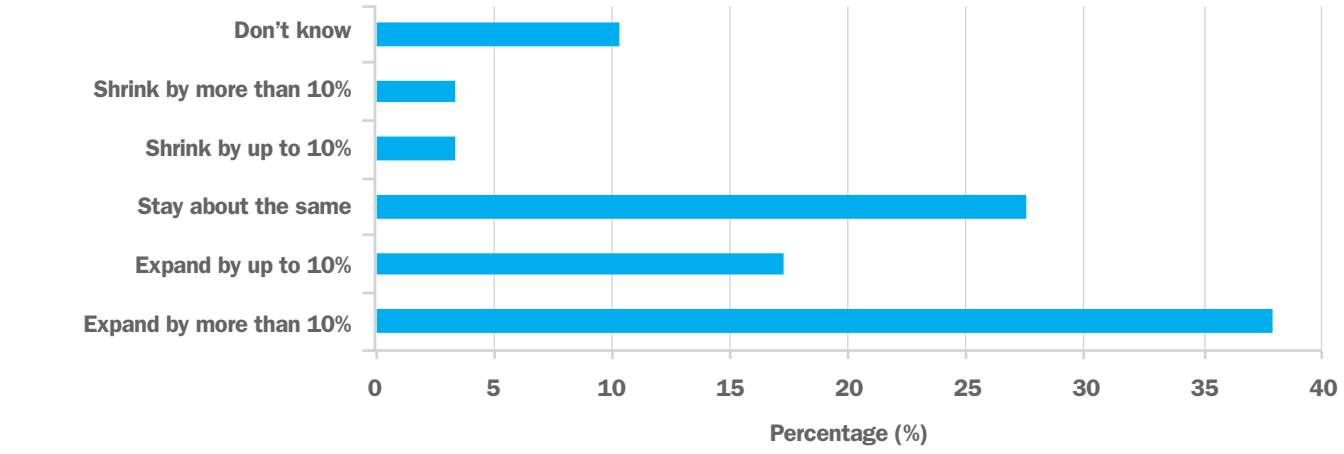
Figure 15: Survey responses to "At the height of this year's mineral exploration do you anticipate that your workforce will..."



Source: MiHR Exploration Survey, 2017

When asked about future expectations regarding their workforce over the next couple of years, the respondents expressed the same optimism. Almost 55 per cent of the respondents agreed that the workforce would expand in the next few years and 28 per cent indicated that it would stay the same (Figure 16). Seven per cent of the respondents stated that their workforce would shrink from their current level. This is an unusual pattern, since none of the respondents indicated any pessimistic sentiments in the current scenario.

Figure 16: Employer responses to "Thinking of the number of employees you expect to be working in mineral exploration at the height of the mineral exploration season this year, over the next couple of years, do you anticipate your workforce will..."

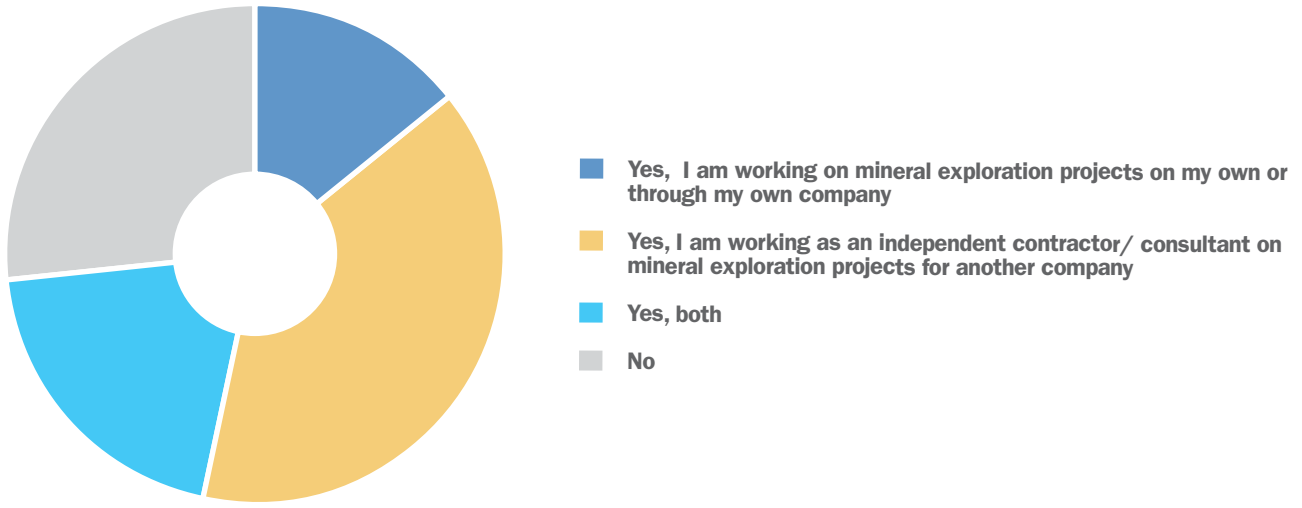


Source: MiHR Exploration Survey, 2017

Exploration consultants/ contractors

A total of 140 consultants/contractors responded to the survey. Contractors' work requires a contingent of independent individuals who have specialized skills and are relatively flexible in work arrangements and locations through short-term economic cycles. Almost 40 per cent of the contractors surveyed indicated that they are currently working exclusively for other companies, whereas 14 per cent are working only on projects generated through their own company. An additional 20 per cent indicated that they are working on their own projects, as well as for other companies. Twenty-six per cent of contractors surveyed are not engaged (Figure 17).

Figure 17: Type of company where contractors are currently working on mineral exploration projects

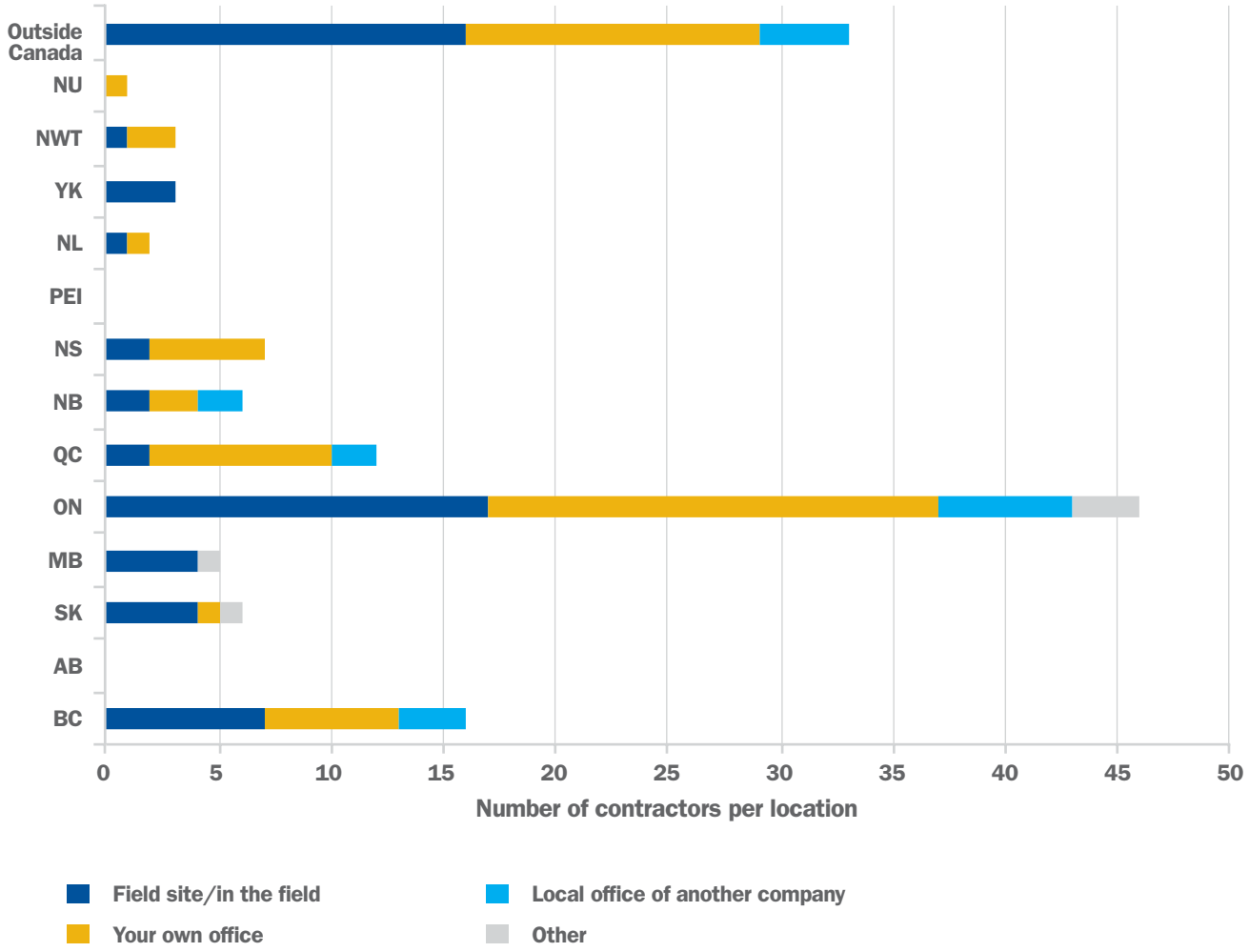


Source: MiHR Exploration Survey, 2017

Source: MiHR

Figure 18 shows that respondent contractors spend most of their time working either out of their own offices or in the field. The majority of the contractors surveyed reported they spend most of their time working in Ontario, likely representative of the high number of responses from Ontario. The second-largest geographic concentration of contractors surveyed (24 per cent) were working on international projects, supporting the statement that mineral exploration is a global industry. This globalization of mineral exploration could also help explain the high share of immigrants (Figure 9) in the exploration sector relative to other sectors in the mining industry.

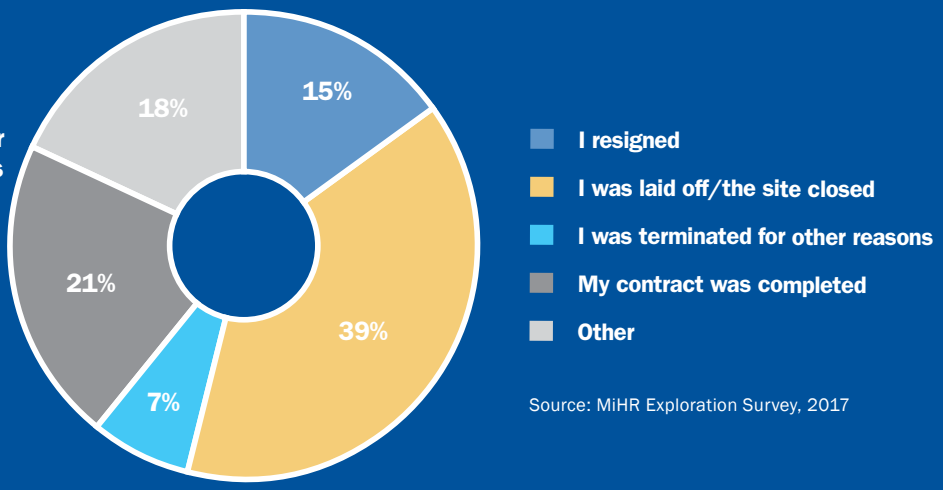
Figure 18: Location of projects that contractors surveyed spent most of their time working in and the type of work they were conducting



Source: MiHR Exploration Survey, 2017

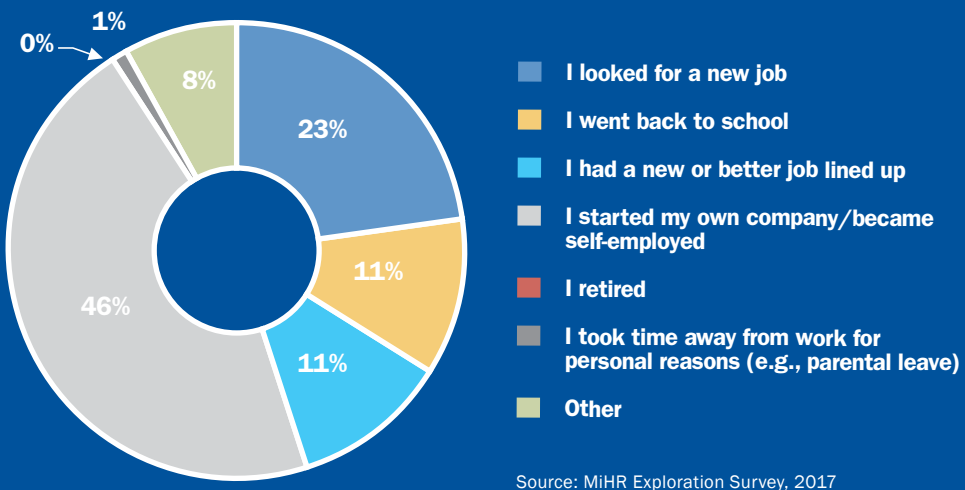
Almost 80 per cent of contractors surveyed had previously worked as an employee of a mineral exploration company. When asked why they left their previous role, close to 40 per cent indicated that they were laid off or the site at which they worked had closed, and an additional 21 per cent had completed their contract (Figure 19). Of the contractors who were formerly employed by a mineral exploration company, almost 50 per cent became self-employed/ started their own company as a result of employment separation (Figure 20).

Figure 19: Reason for leaving former exploration company employment as indicated by respondents who are current contractors



Source: MiHR Exploration Survey, 2017

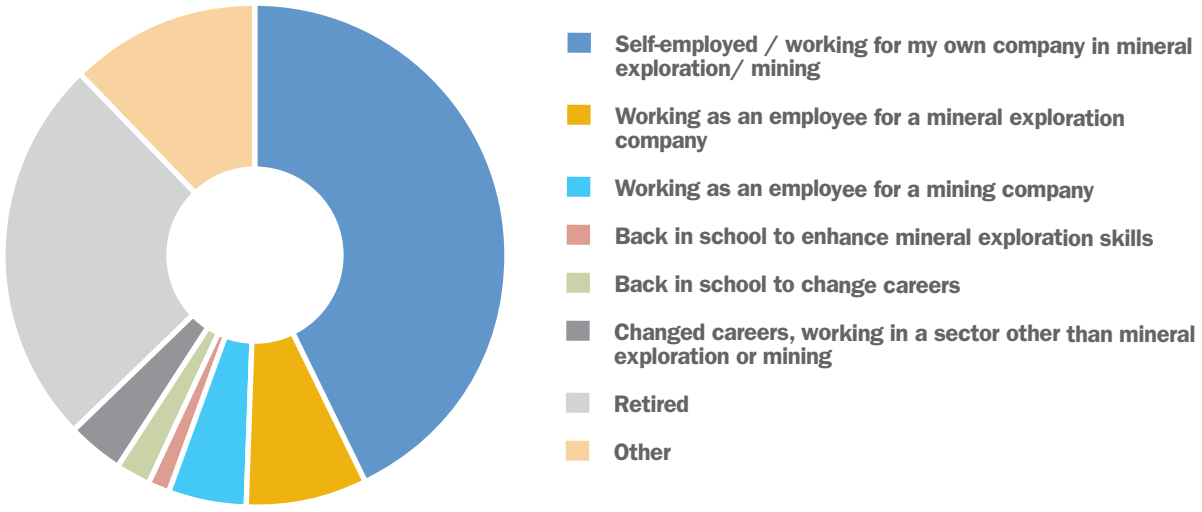
Figure 20: Responses on what former mineral exploration company employees did as a result of leaving their previous organization



Source: MiHR Exploration Survey, 2017

Forty-three per cent of contractors currently working in exploration plan to exit the workforce in the next five years, either through retirement, changing careers, returning to school or other reasons that will permanently remove them from the workforce (Figure 21). Contractors make up a significant portion of the exploration workforce (over 35 per cent of those surveyed), and the exploration industry could lose a significant amount of knowledge and experience that will be difficult to replace, especially given the lack of mid-career workers in mineral exploration.

Figure 21: What contractors/consultants see themselves doing in five years

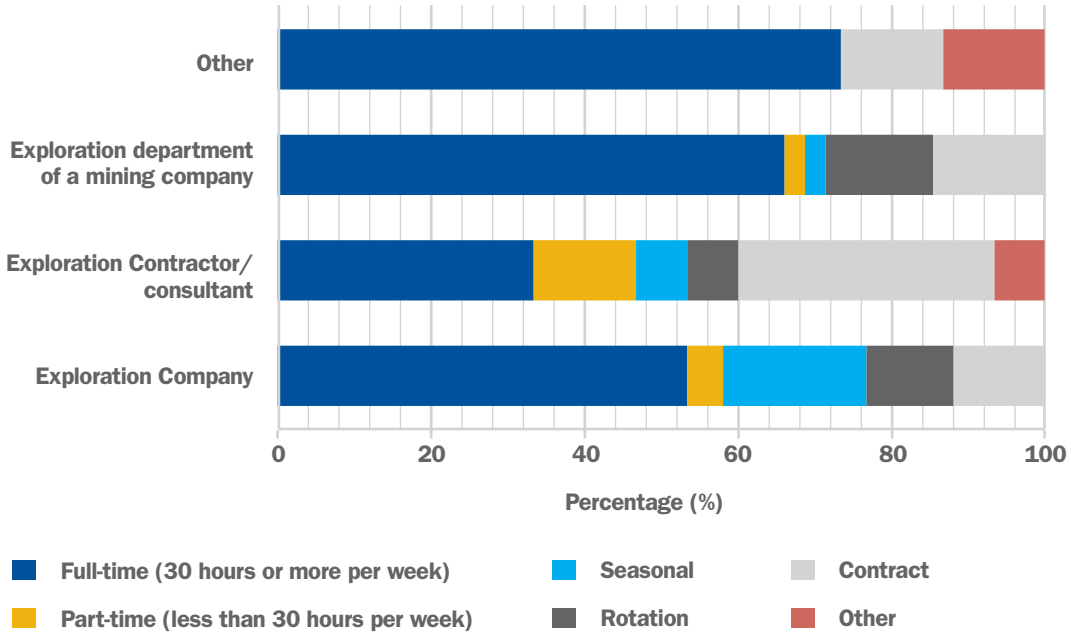


Source: MiHR Exploration Survey, 2017

Workers

A total of 143 workers in mineral exploration responded to the survey, representing 36 per cent of the total respondents. Of this total, 86 per cent currently work in the exploration industry and 14 per cent have worked for a company in the exploration industry in the past (Figure 22). Most exploration workers work full-time and "full-time" is the dominant employment type for three of the four employer types; exploration contracting/consulting companies tend to use a wider variety of employment types. Responses show that contract work is more common with exploration contractors/ consultants than full-time work, likely because contracts are awarded to coincide with project timeframes.

Figure 22: Type of employment vs. type of employer for workers who responded to the mineral exploration survey

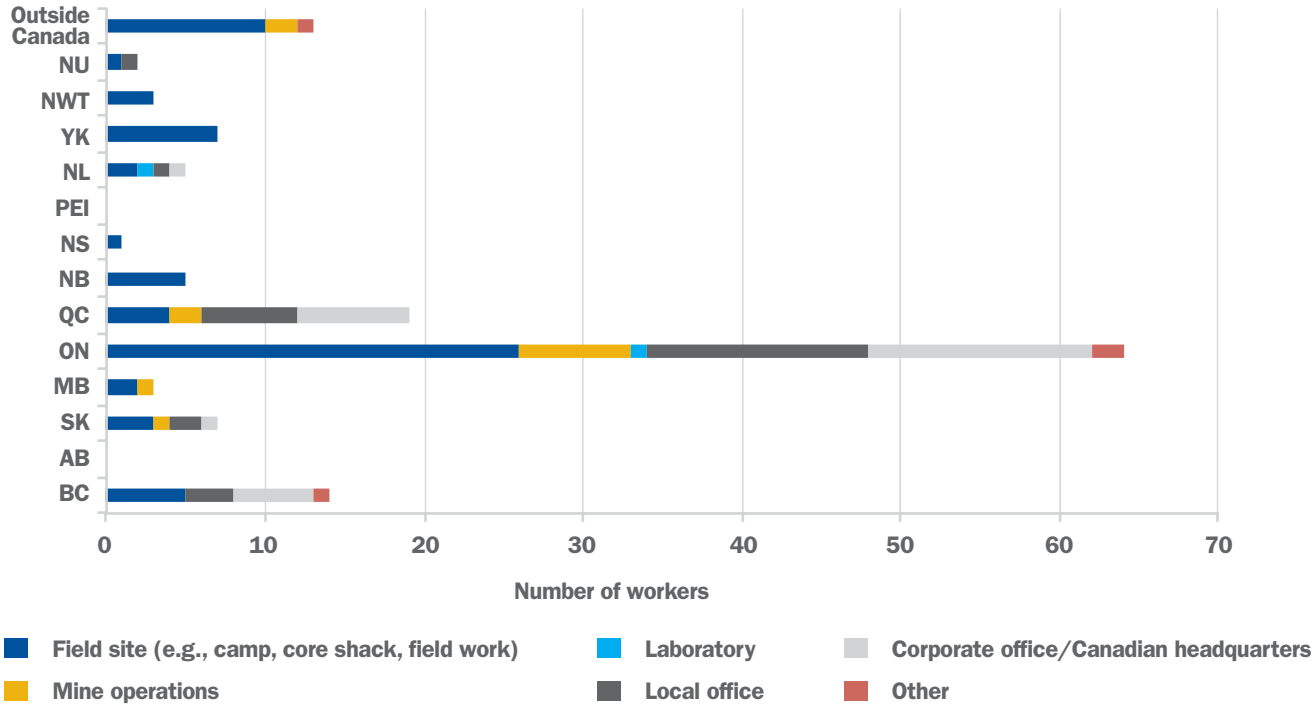


Source: MiHR Exploration Survey, 2017

Source: PDAC

Forty-eight per cent of exploration workers surveyed spend the majority of their time conducting field work, and a smaller percentage spend their time working out of local or corporate offices (Figure 23). Mineral exploration work conducted in Canada's North (Northwest Territories, Yukon and Nunavut) is predominantly field-based, with most of the workers in the North indicating that they spend most of their time in the field. Work conducted in offices (both local and corporate) is limited to one territory and five provinces — Nunavut, Newfoundland, Quebec, Ontario, Saskatchewan and British Columbia, all of which have significant exploration projects underway.

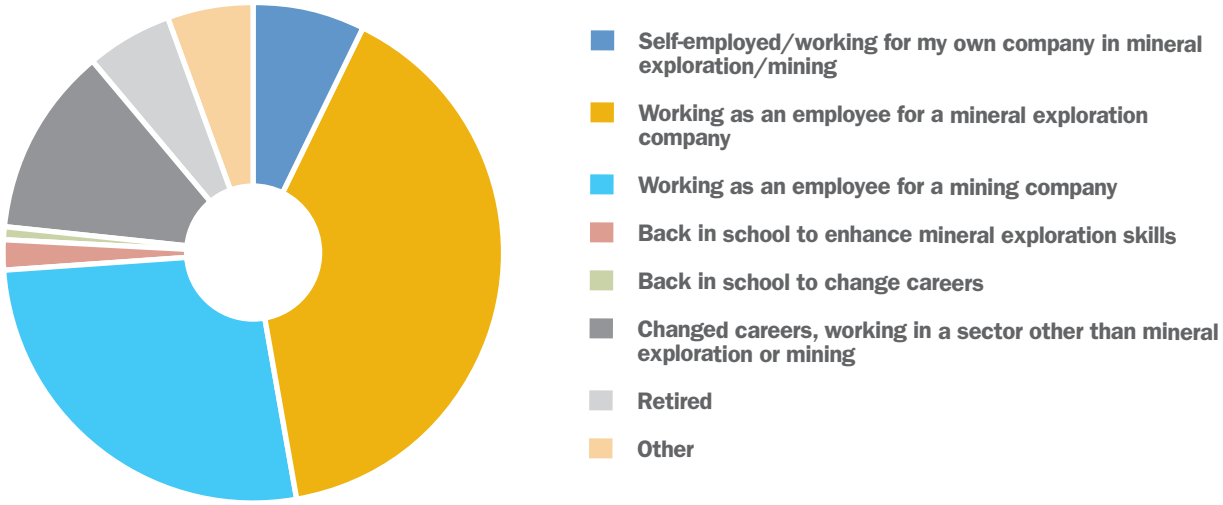
Figure 23: Type of work vs. location of work for exploration workers surveyed



Source: MiHR Exploration Survey, 2017

Seventy-four per cent of surveyed workers indicated that they plan to remain in either the exploration or mining industry over the next five years (Figure 24). The remaining 26 per cent indicated that they plan on permanently leaving the exploration and mining workforce. Only 6 per cent of those surveyed indicated that their exit would be related to retirement, while 13 per cent were planning to change careers permanently, taking with them a great deal of experience.

Figure 24: What workers surveyed see themselves doing in five years



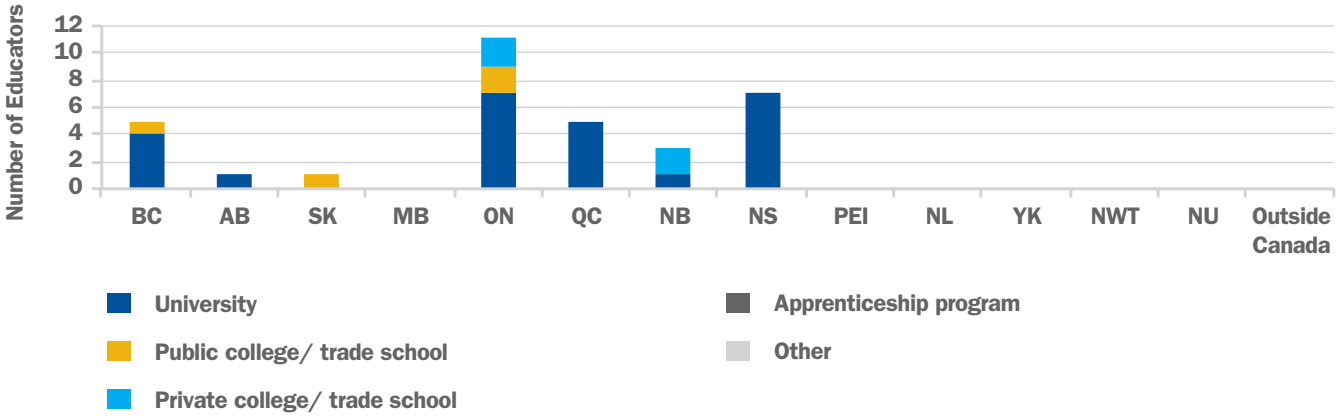
Source: MiHR Exploration Survey, 2017

Educators

Although there were only 32 educators who responded to the exploration survey, their responses provided important insights into the training and development programs offered to future exploration workers. The high proportion of university educators (76 per cent) that responded to the survey aligns with the high level of education required in the mineral exploration industry and the high number of university student respondents. As with most groups of respondents, the majority of educators were from Ontario. There was also a large number of responses from educational institutions in Nova Scotia (Figure 25).

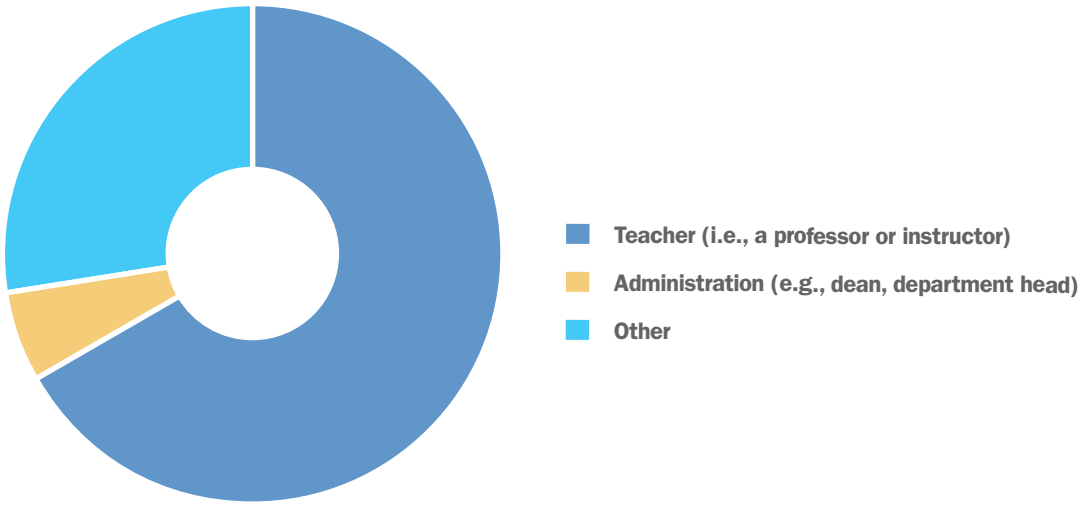
Most of the respondents (67 per cent) were teachers (professors or instructors), 6 per cent worked in administrative roles (deans, department heads) and an additional 14 per cent worked as researchers in universities (Figure 26).

Figure 25: Location and type of educational institution where educator respondents work



Source: MiHR Exploration Survey, 2017

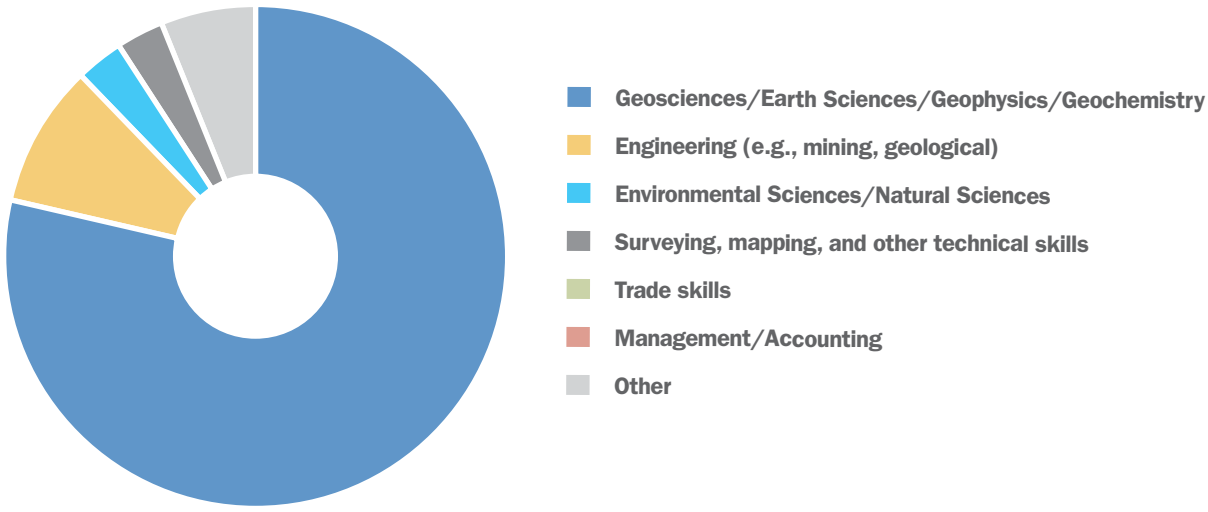
Figure 26: Role of educators who responded to the mineral exploration survey



Source: MiHR Exploration Survey, 2017

Just over 75 per cent of the educators that responded to the mineral exploration survey provided education related to geosciences/earth sciences/geophysics/geochemistry, followed by engineering-related training (9 per cent) (Figure 27). This was consistent with the educational background indicated by respondents from other groups and reflects the types of programs in which the student respondents were enrolled.

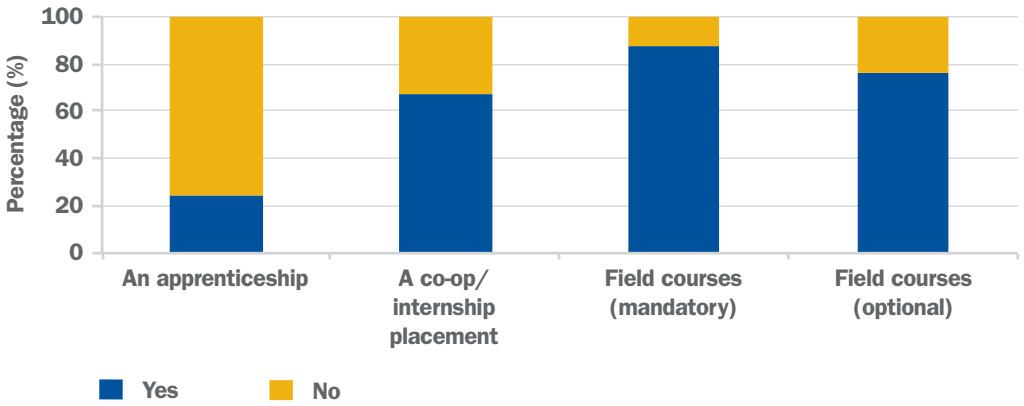
Figure 27: The type of mineral exploration training and education provided by educators who responded to the survey



Source: MiHR Exploration Survey, 2017

Almost 90 per cent of educators indicated that their program offers mandatory field courses, and most offer optional field courses to help students further develop their field techniques. While more than half of the educator respondents indicated their program offers a co-op/internship program (Figure 28), less than 40 per cent of students surveyed indicated that they have or will participate in a co-op or internship.

Figure 28: Work-integrated learning offered by educational institutions surveyed

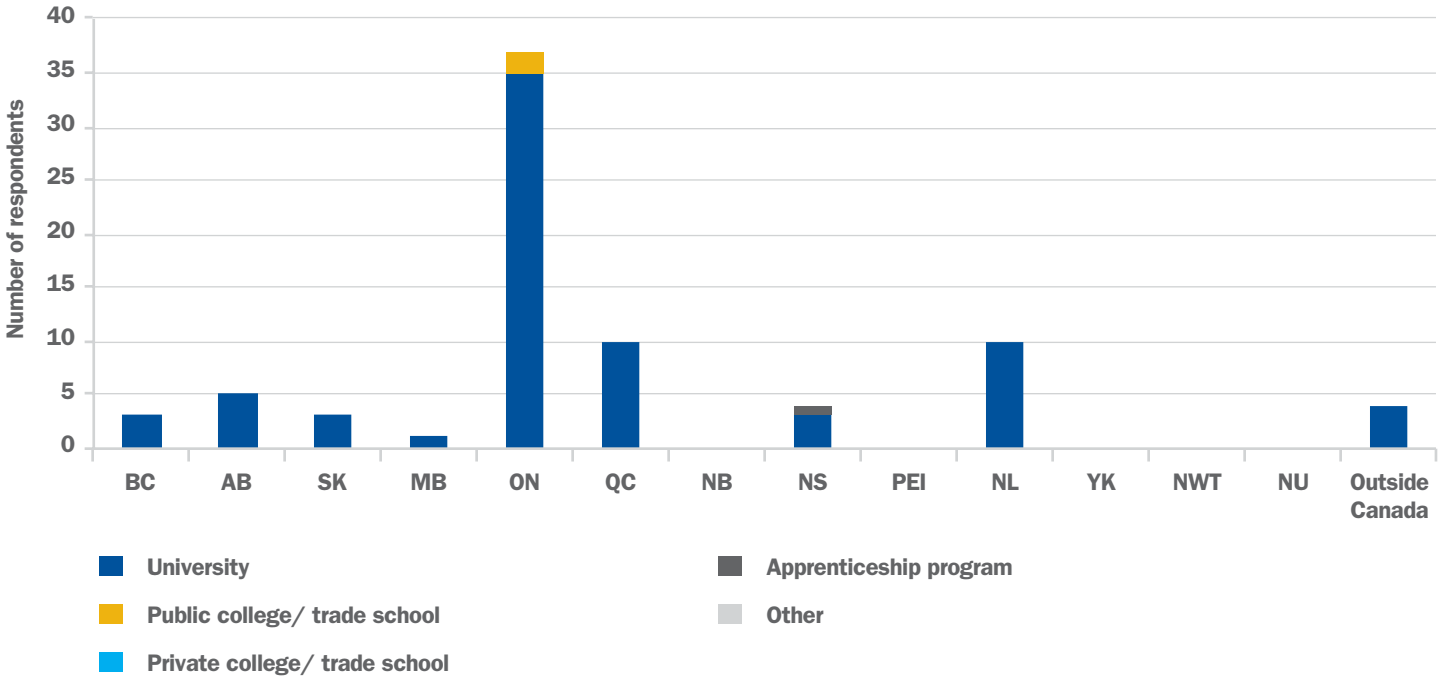


Sources: Labour Force Survey, 2017; MiHR Exploration Survey, 2017

Students

A total of 77 students responded to the exploration survey. They were predominantly from universities, with less than 5 per cent from other types of educational institutions. This high representation of university students is reflective of the higher level of education required in the mineral exploration industry, with 90 per cent of overall respondents indicating they have at least a Bachelor's degree (Figure 10). The students that responded to the survey were primarily from educational institutions located in Ontario (Figure 29) — consistent with the predominance of Ontario respondents in most groups.

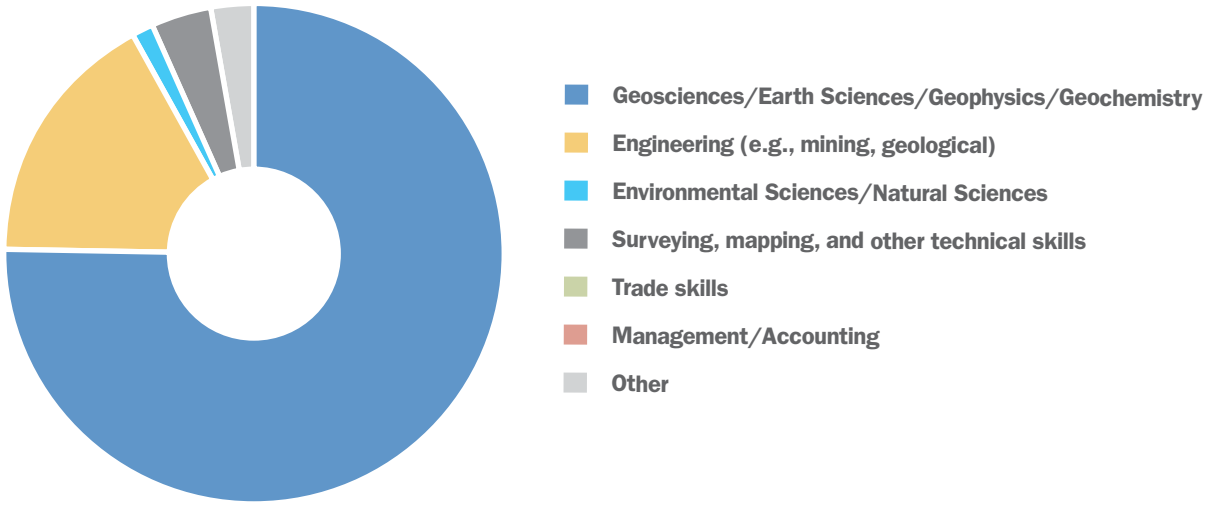
Figure 29: Location and type of institution that student respondents are currently attending



Source: MiHR Exploration Survey, 2017

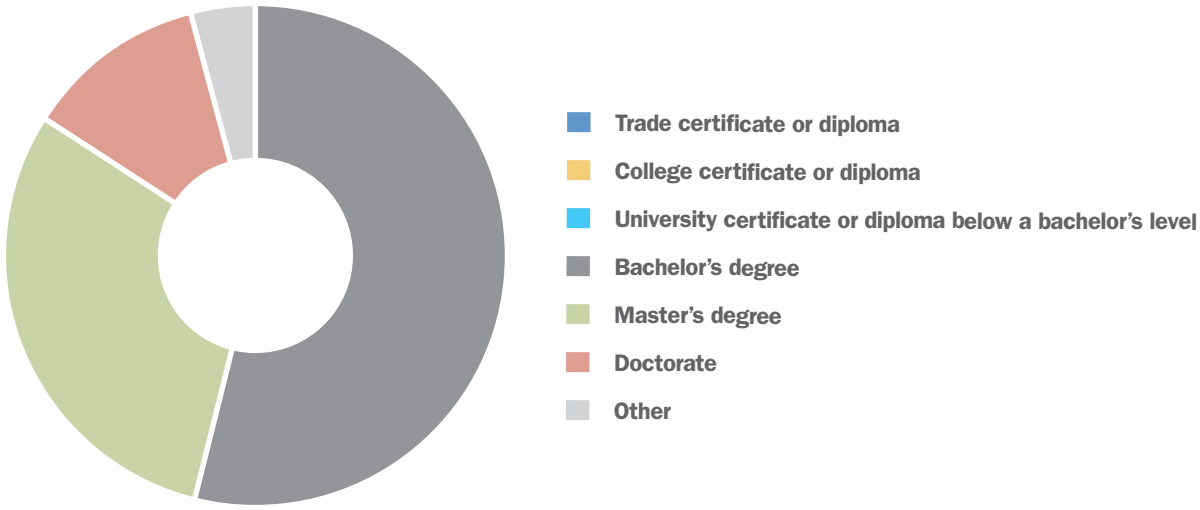
The majority of students that responded to the mineral exploration survey were enrolled in geosciences/earth sciences/geophysics/geochemistry programs; the second-largest group was students in engineering programs (Figure 30). This is consistent with the distribution of educational background indicated by other respondent groups. Data collected shows that 96 per cent of the students indicated they were pursuing a Bachelor's degree or higher (Figure 31), which also corresponds to the high level of education observed in responses from other groups.

Figure 30: Program of study for the students that responded to the survey



Source: MiHR Exploration Survey, 2017

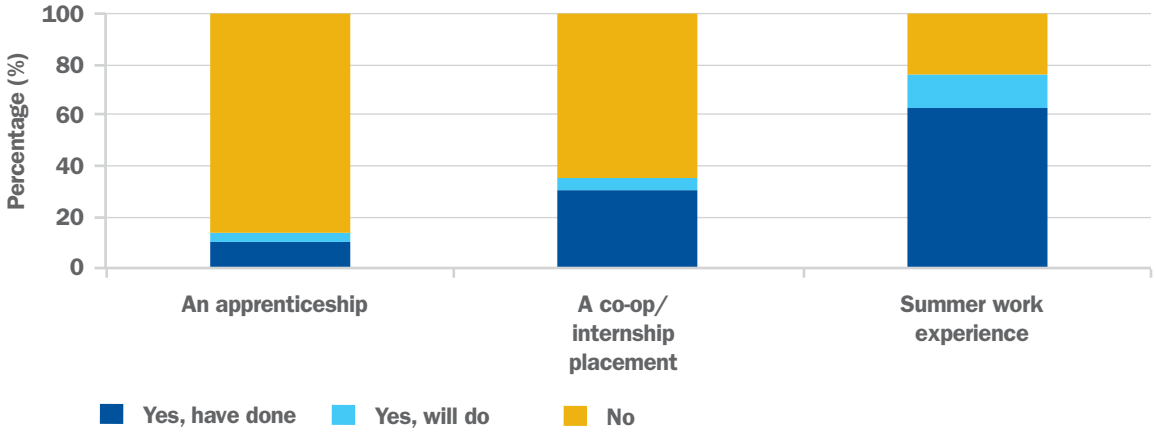
Figure 31: Degree being pursued by students that responded to the survey



Source: MiHR Exploration Survey, 2017

Most of the students (>85 per cent) surveyed indicated they will not complete an apprenticeship as part of their program, and over 60 per cent said they will not complete a co-op or internship placement. Approximately 70 per cent of respondents have already completed or will complete some form of summer work experience, suggesting that summer work experience is the most common way that students in exploration gain experience.

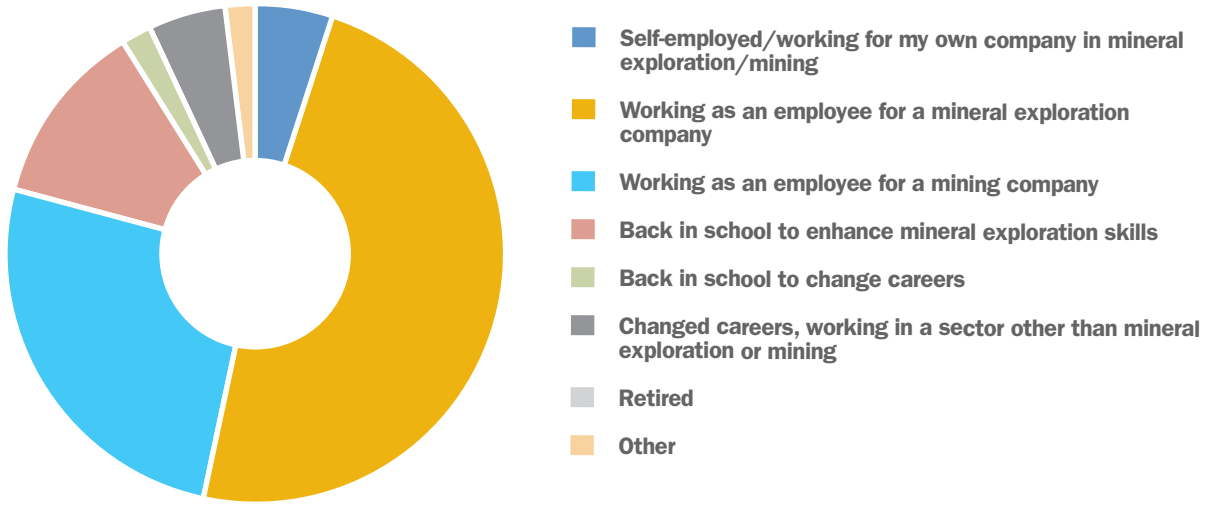
Figure 32: Types of work-integrated learning related to the program that students are enrolled in (based on respondents)



Source: MiHR Exploration Survey, 2017

When asked what they saw themselves doing in five years, most of the student respondents indicated they would likely be working as an employee for a mineral exploration company (48 per cent) or for a mining company (26 per cent). More than 90 per cent of respondents said they intend to remain in the mining or mineral exploration industry; 7 per cent of student respondents plan on leaving the industry to pursue a career in another sector with the next five years.

Figure 33: Responses from students as to what they see themselves doing in five years

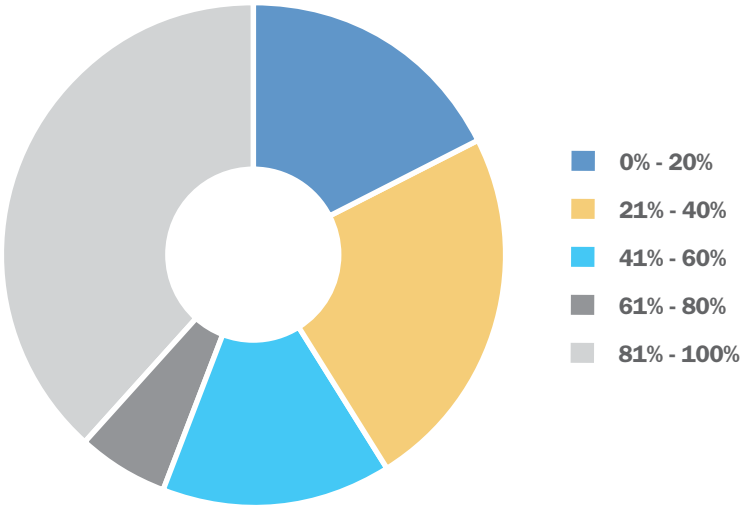


Source: MiHR Exploration Survey, 2017

Affiliates

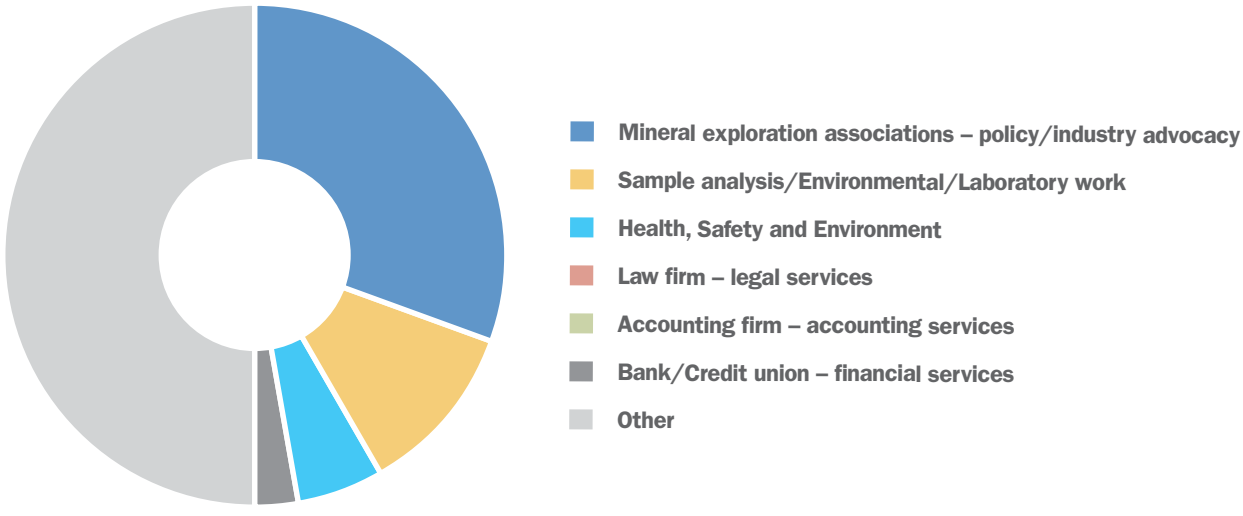
Affiliates comprise the smallest category of respondents and represent 9 per cent of the total survey sample. Affiliates work in affiliation with the exploration industry, but do not conduct primary exploration activities. The affiliates surveyed reported they spend an average of 55 per cent of their time working on mineral exploration projects (Figure 34). The roles of affiliates include mineral exploration associations, government associations, and providers of laboratory work and financial services. The largest number of respondents fits into the "other" category (Table 1).

Figure 34: Percentage of time affiliates who responded to the survey spend working in the exploration industry or on exploration projects



Source: MiHR Exploration Survey, 2017

Figure 35: Roles of mineral exploration affiliates who responded to the survey



Source: MiHR Exploration Survey, 2017

Table 1: List of "other" organizational roles for affiliates who responded to the survey

Government
Community/Indigenous Relations
Professional association
Provincial government
Recruitment services
Software solutions
Regulator
Engineering/ geochemistry firm
Map and information provider
Government
Stock Exchange
Training organization
Equipment manufacturer
Infrastructure development
Federal government research
Communication and Public Affairs
First Nations relations, government lobbying
Communications

Source: MiHR Exploration Survey, 2017

Source: PDAC

SECTION TWO: KEY OBSERVATIONS

Source: PDAC

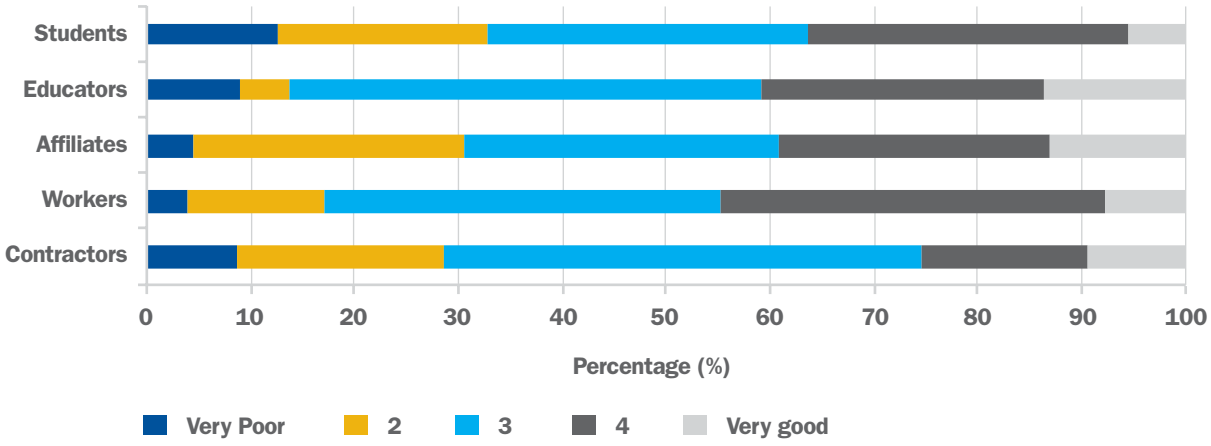
Career Outlook

Respondents were asked to rank their assessment of the career outlook for workers in the Canadian mineral exploration sector over the next five years — on a scale of 1 to 5, with 1 being very poor and 5 being very good (Figure 36).

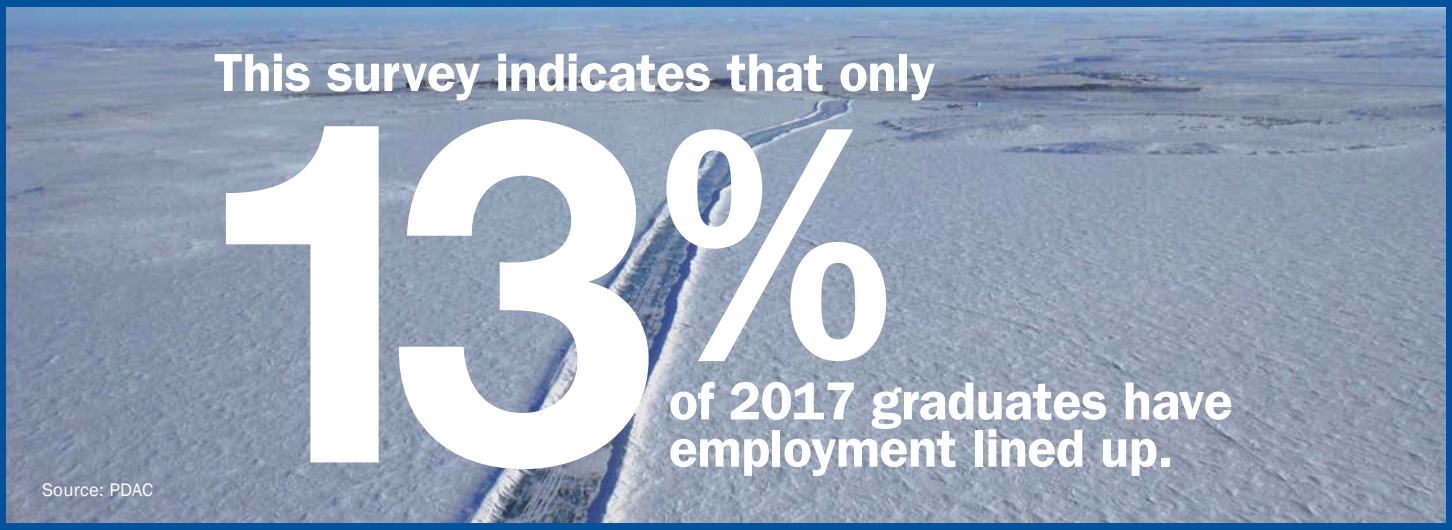
The majority (40 per cent) choose a rank of 3, followed by 4, suggesting that they either think that the career outlook for the industry will either stay the same or improve marginally. Students had a more negative outlook on the mineral exploration sector than any other group, with 12 per cent indicating a poor or very poor rating.

Thirty-five per cent of respondents from all groups surveyed ranked the career outlook in mineral exploration as good or very good, while the remaining 25 per cent ranked the outlook as poor or very poor.

Figure 36: Career outlook for the mineral exploration sector over the next five years

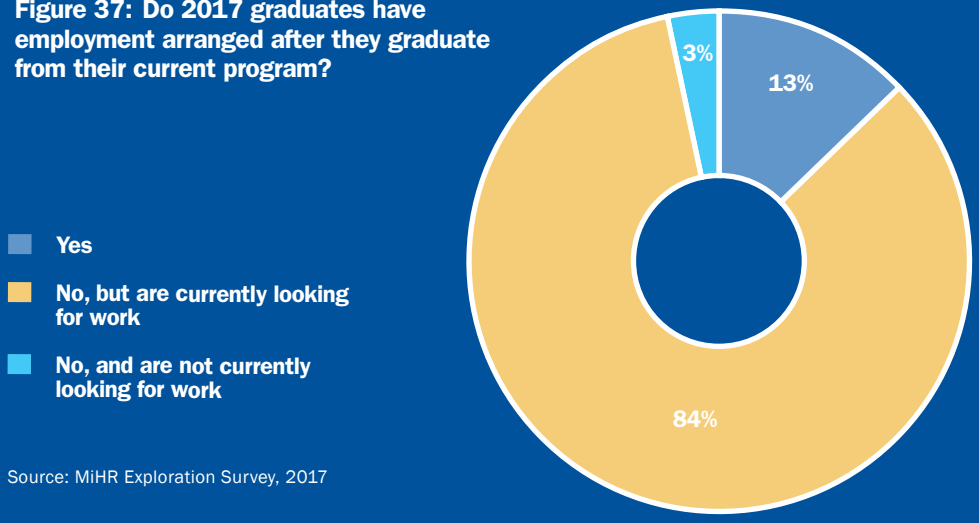


Source: MiHR Exploration Survey, 2017



One possible reason that students have a more negative career outlook than other groups is that over 80 per cent of students graduating in 2017 indicated they did not have employment arranged when they graduated from their current program and they were actively looking for work (Figure 37). This lack of employment opportunities for graduates could significantly impact the outlook for the mineral exploration industry for all students, as they see their graduating colleagues struggling to find employment.

Figure 37: Do 2017 graduates have employment arranged after they graduate from their current program?



Source: MiHR Exploration Survey, 2017

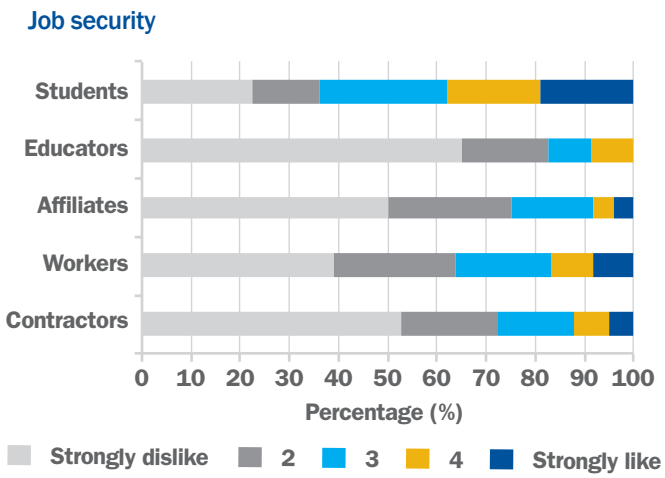
Source: Callinex Mines Inc.

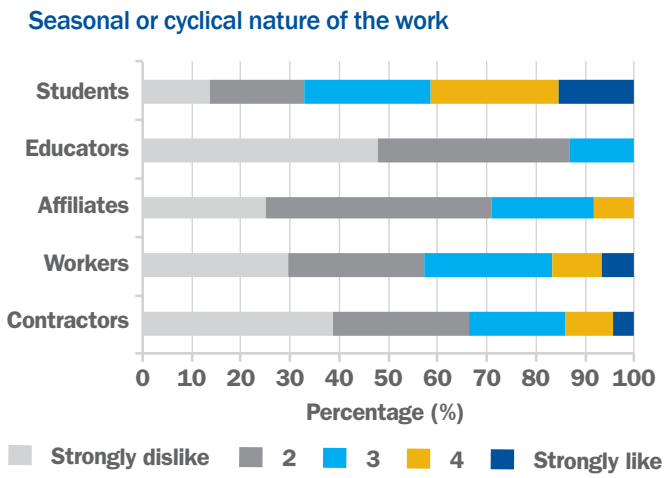
Opinion about working in exploration

Respondents were asked to rate 16 aspects of working in the mineral exploration industry using a scale of 1 to 5, with 1 representing the most negative opinion and 5 representing the most positive opinion. Workers, contractors and students were asked which aspects they disliked or liked about working in the mineral exploration industry, whereas affiliates and educators were asked which aspects they thought discouraged or encouraged people to work in the mineral exploration industry (Figure 38).

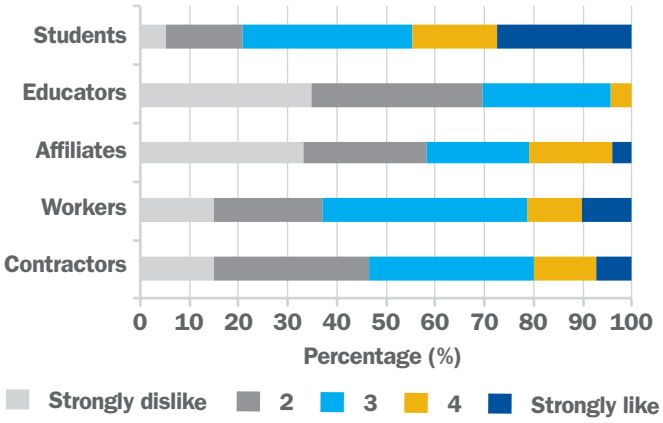
In general, all five groups surveyed had similar views of each aspect of working in mineral exploration, with common trends observed across all groups with respect to each aspect—whether the aspect positively or negatively affected their choice to work in the industry. Overall, students seemed to have a more positive opinion about most aspects of the mineral exploration industry than any of the other groups surveyed.

Figure 38: How each group of respondents ranked aspects of working in the mineral exploration industry

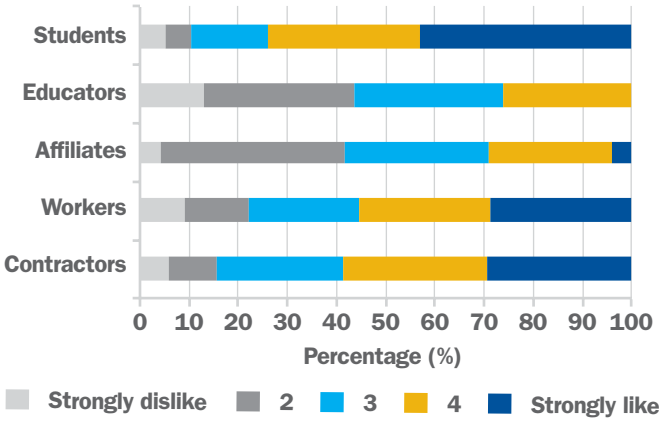




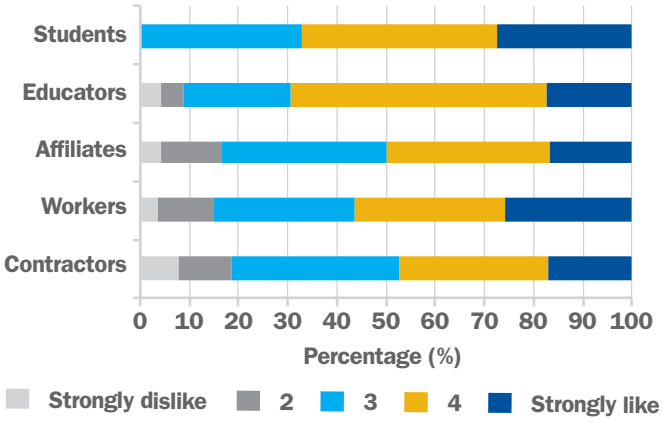
Work-life balance



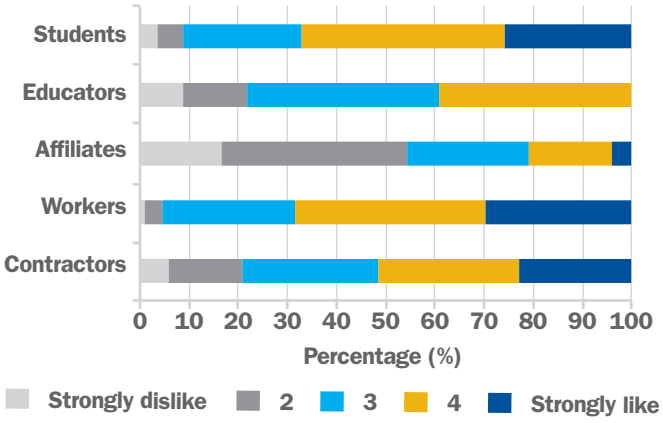
Flexibility in scheduling



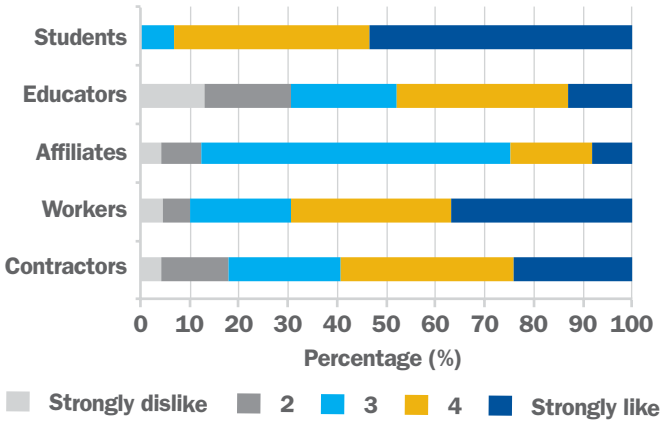
The level of compensation and benefits



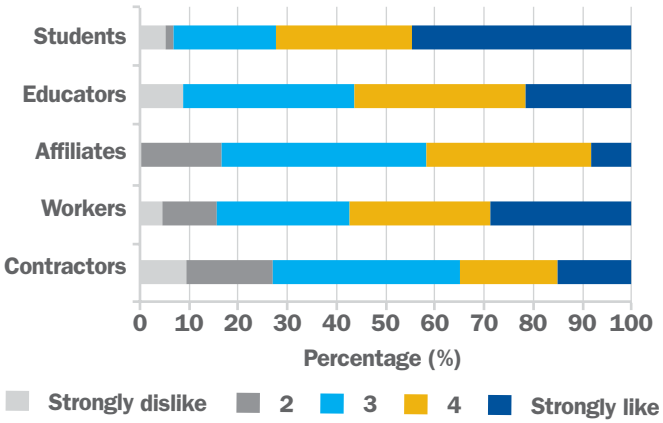
Workplace Culture



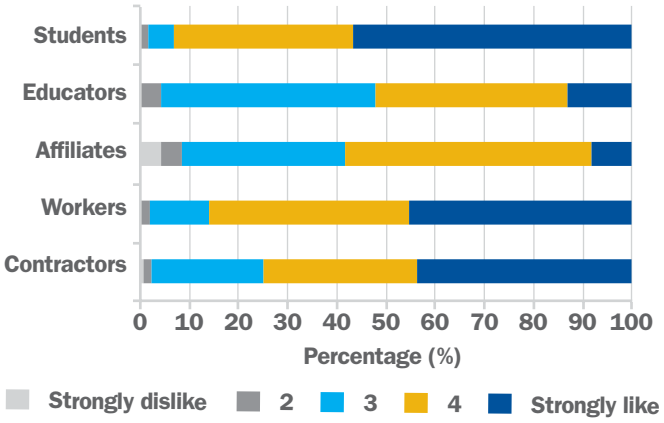
Ongoing training, learning and professional development



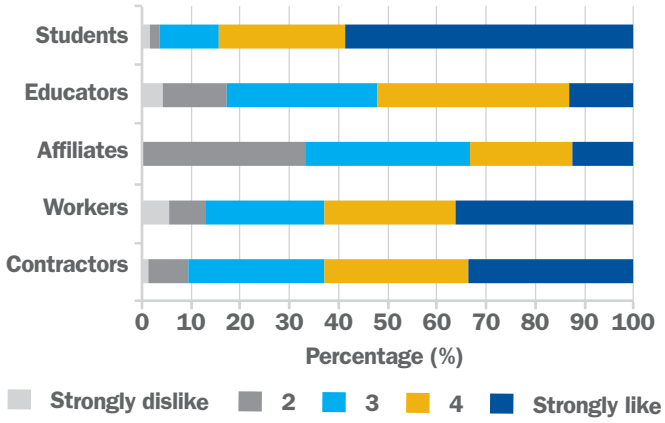
Opportunities for career advancement



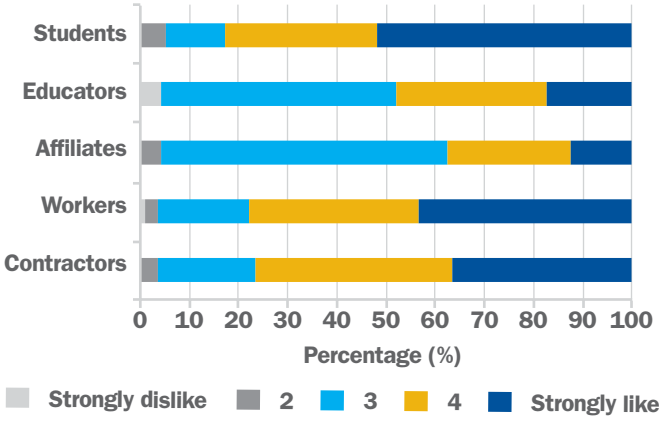
Working with new technologies



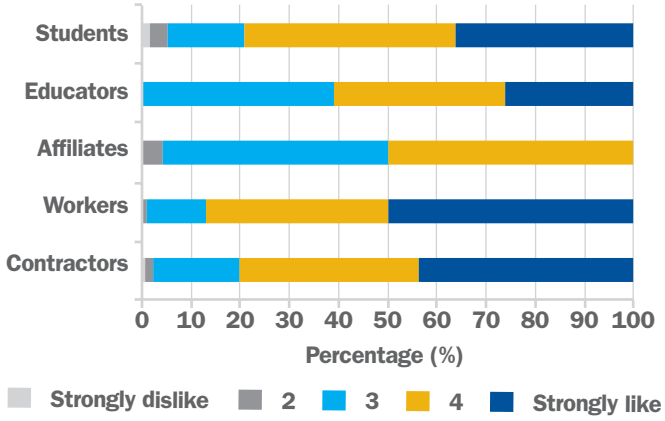
Travel to where you are needed



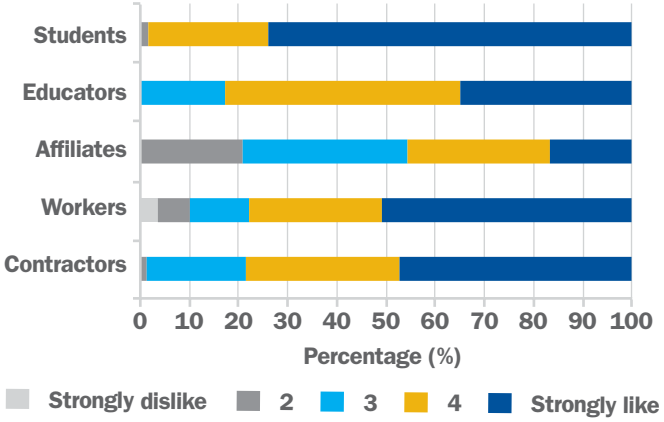
Being part of a professional community



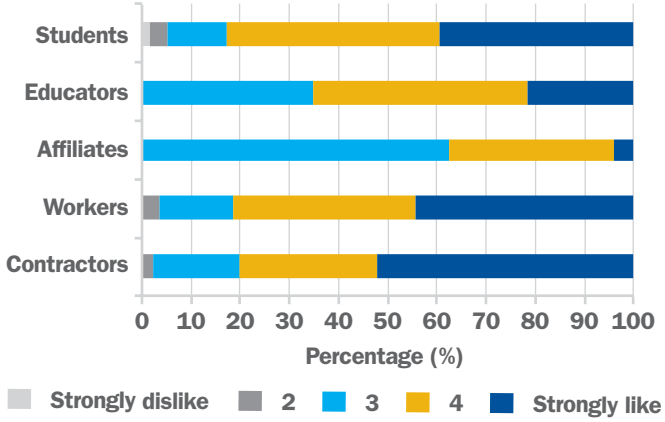
Technical Challenges

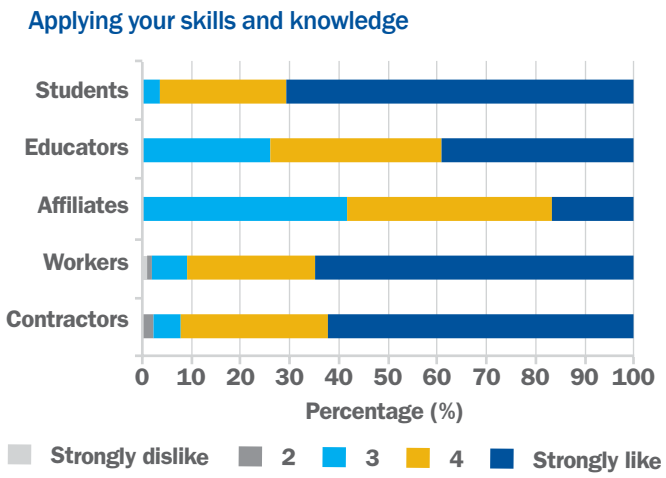


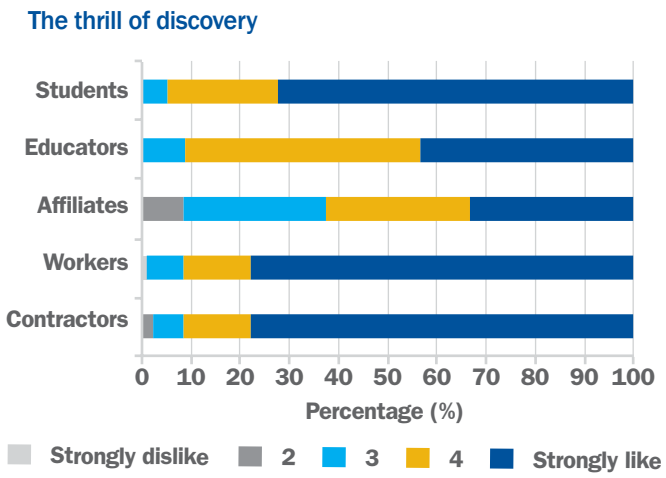
Field Work



Working independently





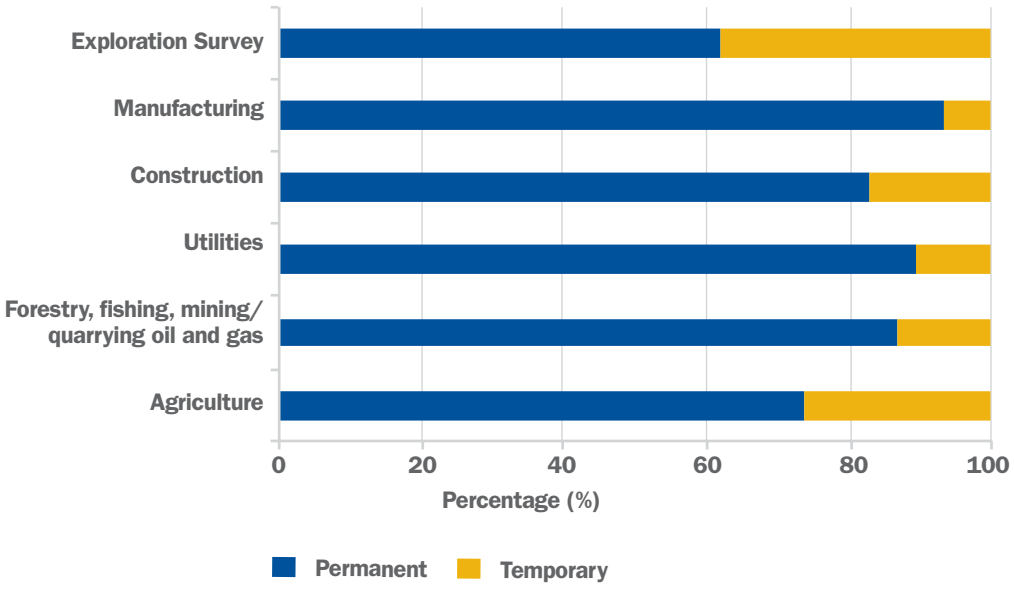


Source: MiHR Exploration Survey, 2017

Several themes cut across all of the groups when analyzing the pros and cons of working in mineral exploration. For instance, most people in the exploration industry like working independently, doing field work, the thrill of discovery, applying their skills and knowledge, and the technical challenges associated with exploration. The aspects that received negative opinions include work-life balance, job security and the cyclical nature of the exploration industry.

Labour market security is one of the key variables that are used to determine job quality (OECD, 2014). Labour market security encapsulates the probability of job losses and the associated economic cost. A higher proportion of full-time positions in an industry is an indicator of labour market security. Results from employer survey data indicate that 38 per cent of jobs were non-permanent or seasonal, indicating lower job market security than other resource industries in Canada (Figure 39). Job security was the most negatively rated aspect of the Canadian mineral exploration industry by all people surveyed (Figure 38).

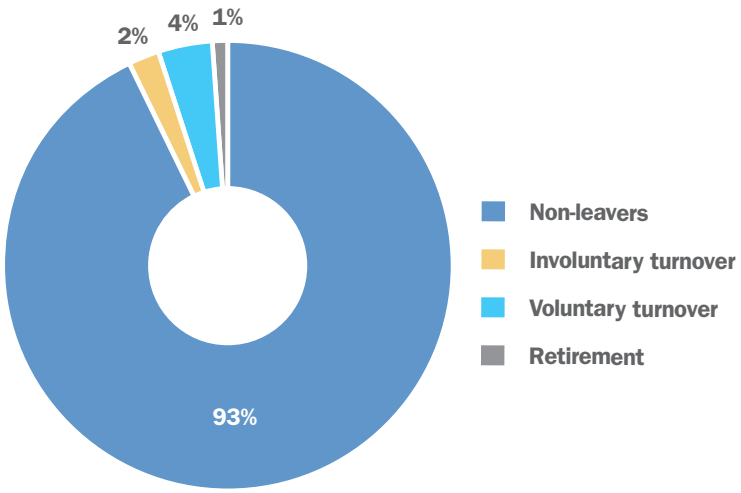
Figure 39: Distribution of permanent and non-permanent jobs for various industries in Canada



Source: Statistics Canada, 2016

Recruiting and retaining workers with the right skills is essential for the long-term growth and success of a company. Historically, employment in exploration moves in tandem with commodity prices, resulting in high levels of exploration activity when prices are high and low levels of activity when they are low. In a volatile environment, as in the exploration sector, retaining workers during an economic downturn is an organizational challenge and often, mass layoffs are the result of a commodity price drop. All of this makes exploration a cyclical industry, which many of the people surveyed dislike (Figure 38). Employers surveyed indicated that the exploration industry has a turnover rate of 7 per cent (based on data from the previous 12 months) (Figure 40).

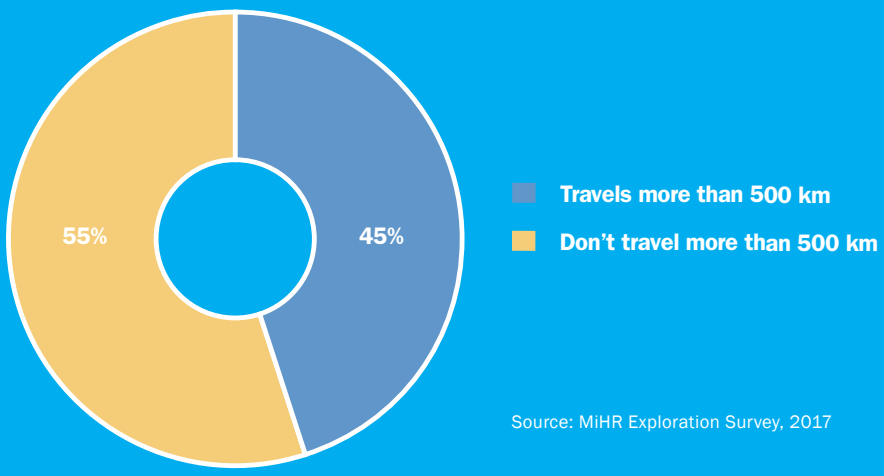
Figure 40: Turnover rate from organizations surveyed



Source: MiHR Exploration Survey, 2017

The intrinsic nature of the exploration sector requires workers to travel to remote sites to do their jobs. Exploration companies and exploration contracting companies indicated that 45 per cent of their workforce needs to commute farther than 500 km to get to the worksite (Figure 41). Although remote work may not appeal to the average Canadian population, field work and travelling to locations where they are needed were both rated very positively by respondents (80 per cent and 64 per cent rated these aspects as things they liked or strongly liked, respectively).

Figure 41: Employer's response to "How many of your organization's workforce travel more than 500 km to remote worksites?"



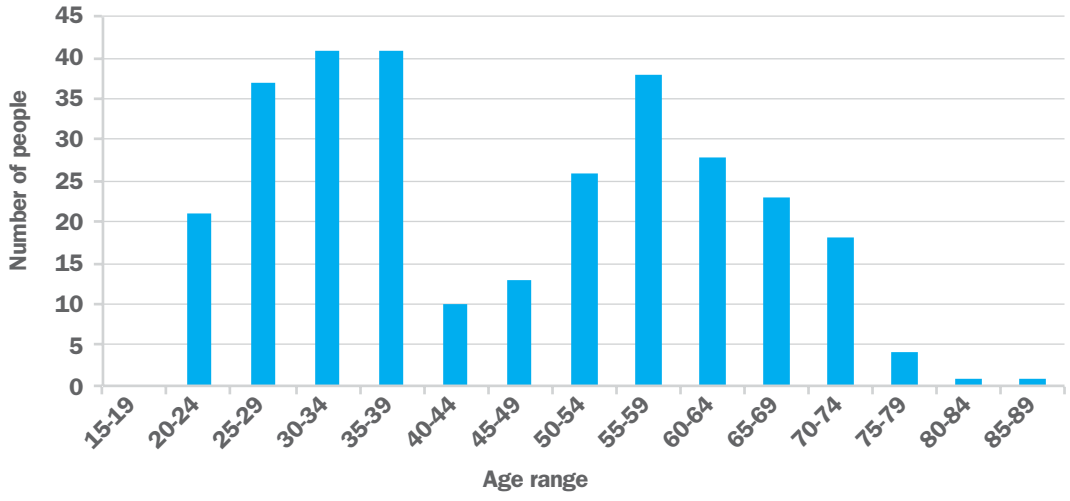
Source: MiHR Exploration Survey, 2017

Source: MiHR

Absence of a mid-career workforce

Despite a large number of respondents under the age of 35, there was also a high number of older respondents, particularly those over the age of 55, representing a sample that is comparatively older than the overall Canadian labour force (Figure 8). Of particular concern is the lack of people in the middle-career age range (40–49), a trend that was observed in all groups of respondents who work in exploration (affiliates, workers and consultants) (Figure 42). This mid-career gap in the labour force is not reflective of the average Canadian workforce or even the mining extraction labour force, suggesting that it is a unique challenge associated with mineral exploration.

Figure 42: Age of respondents in the workforce (includes workers, affiliates and contractors; does not include students and educators)



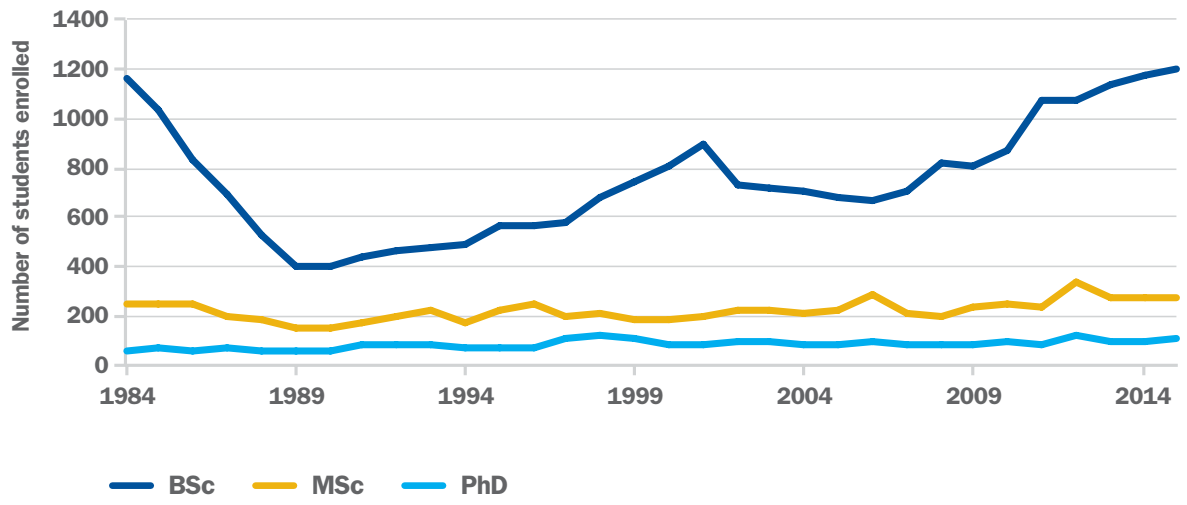
Source: MiHR Exploration Survey, 2017

Source: PDAC

Several factors have been suggested as contributing to this lack of mid-career workers including: mid-career attrition; economic conditions surrounding Black Monday (October 1987) and the associated recession in the early 1990s; changes to tax law amendments in the early 1990s; and a significant drop in geoscience enrollment in the late 1980s/early 1990s (Figure 43).

Most (>80 per cent) of the respondents reported a primary area of study in the geoscience/earth sciences/geophysics/geochemistry fields (Figure 12). This likely reflects the strong geology-related educational requirements of many people in the sector, who are engaged in activities such as planning and mineral assessment, staking, reconnaissance, advanced exploration, and economic evaluation. In addition, if the exploration project is part of a publicly-listed company's portfolio, a comprehensive publicly-available assessment report (NI-43-101) needs to be signed off by a designated qualified person (QP), who generally also holds a professional geoscientist designation. Since the exploration industry is heavily reliant on geoscientists, decreases in geoscience enrolment could suggest a decrease in new entrants to the labour market.

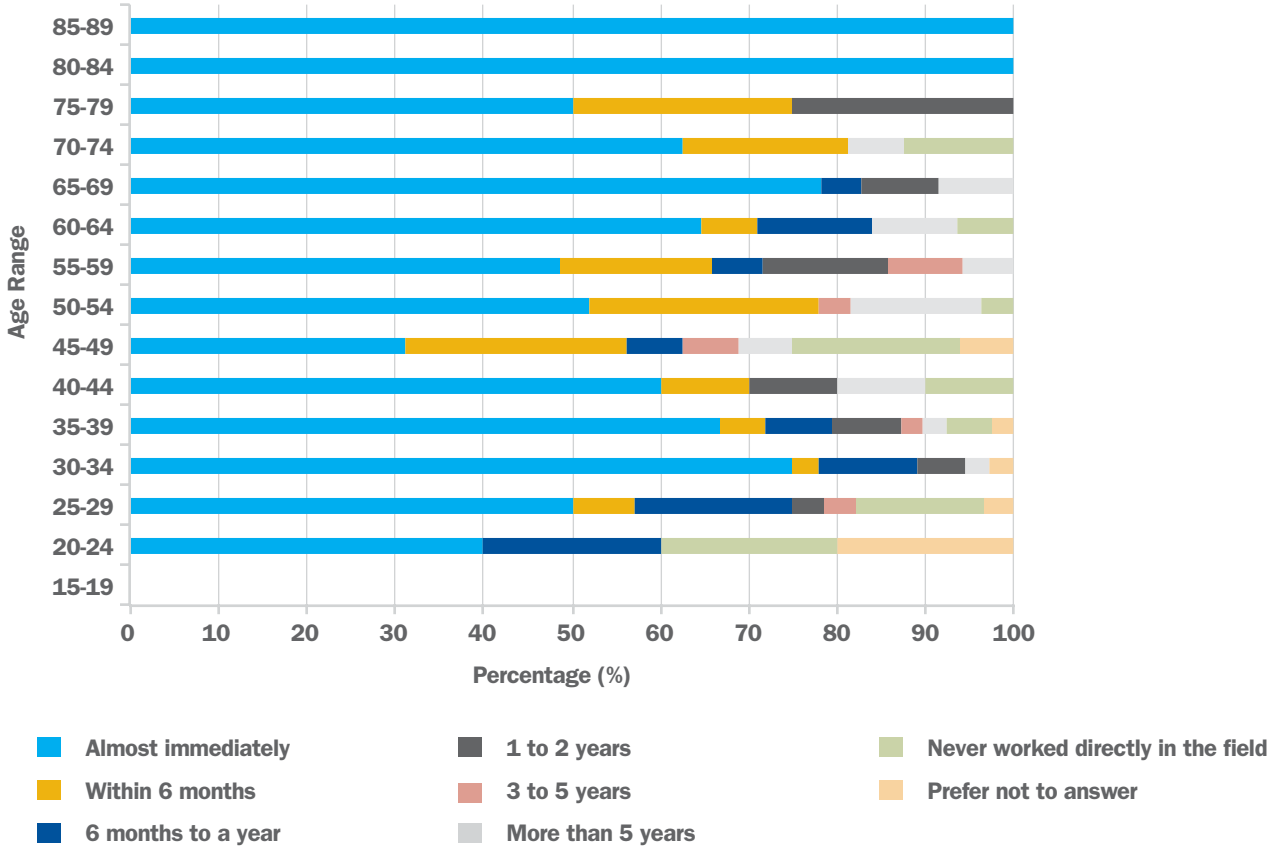
Figure 43: Geoscience enrolment in Canada



Source: Council of Chairs of Canadian Earth Science Departments, 2015

Factors affecting available jobs and job security in mineral exploration in the early 1990s could have deterred people considering entering the industry at that time and led many of them to find work in other industries, very early in their careers. The loss of these workers has likely been propagated over time, resulting in a lower number of mid-career workers today. The survey found that it took significantly more time to find jobs in the mining or exploration industry after leaving school for workers aged 40–49 than other age groups (Figure 44). The survey shows that over 20 per cent of respondents in this age category have never worked directly in the mining or exploration industry — suggesting that the 40–49 age cohorts have been permanently lost from the labour force. Given the data in Figure 44, it should also be noted that it is taking the 20–29 age group longer to find employment .This could be a cause for concern, as it could indicate employment conditions repeating the pattern of workers leaving the exploration and mining workforce in their early-to-mid careers.

Figure 44: Length of time it took respondents to first find employment in the mining or exploration sector after they had left school



Source: MiHR Exploration Survey, 2017

The lack of entrants to the mineral exploration industry in the late 1980s and early 1990s is compounded by the factors that can contribute to mid-career attrition in mineral exploration. These factors could include lack of job security, the cyclical nature of the mineral exploration industry, employment that is highly sensitive to market volatility, and challenges related to work-life balance, given that respondents rated them as negative aspects of the mineral exploration industry (Figure 38).

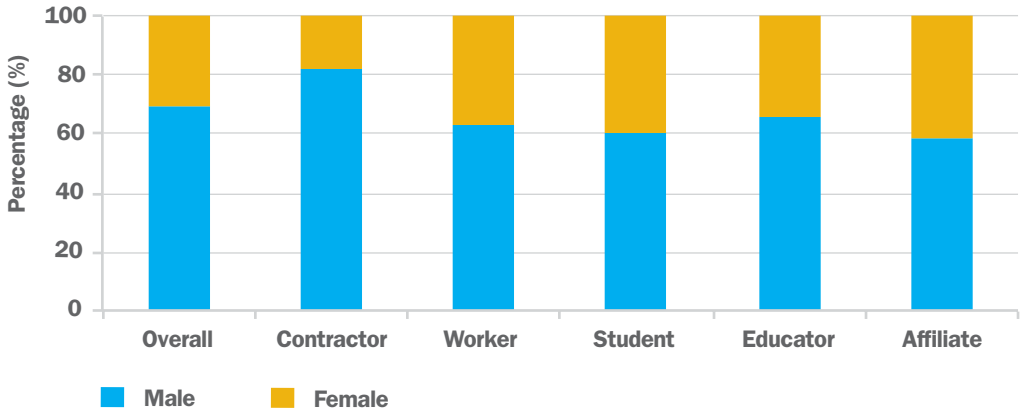
Higher female representation in exploration than mining

In an increasingly competitive market for talent, diversity in the workforce is becoming a prominent solution to address skill shortages. Diversifying the labour force has required an increase in participation, recruitment and retention of under-represented groups, including women. Thirty per cent of respondents to this survey were female. This higher response rate was reflected in all of the categories of respondents (Figure 45). This response rate is almost double the labour force participation rate of women in the mining industry, which currently sits at 17 per cent.

This is interpreted to be an accurate reflection of the Canadian mineral exploration industry, based on the nature of the jobs that make up the exploration industry. The job skills required to work in exploration are highly technical and most jobs require a university degree (at minimum). Eighty-seven per cent of the female respondents indicated that they have a Bachelor's degree, and 40 per cent indicated that they have a graduate-level degree (Master's or PhD) — meeting the high educational and technical demands of the exploration sector.

The increased representation of women with higher education levels is also reflected in the enrolment numbers for post-secondary earth science programs in Canada, where women make up 52 per cent of Bachelor, 53 per cent of Master and 39 per cent of PhD program enrolees (CCCESD, 2016). Furthermore, the number of women registering to become professional geoscientists (P.Geo) is increasing. Currently only 20 per cent of P.Geo's registered in Canada are women, but they make up 37 per cent of registered Geoscientists-in-Training (GIT) (Geoscientists Canada, 2017).

Figure 45: Number of male and female respondents by job category



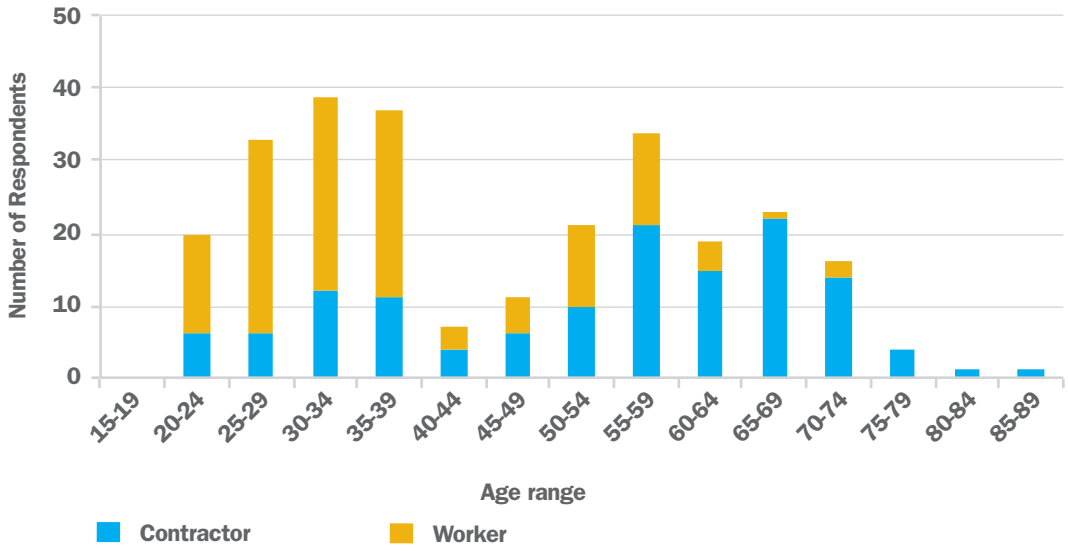
Source: MiHR Exploration Survey, 2017

Source: MiHR

The lowest response rate from women was in the contractor category (18 per cent), whereas the highest response rate was from affiliates (41 per cent).

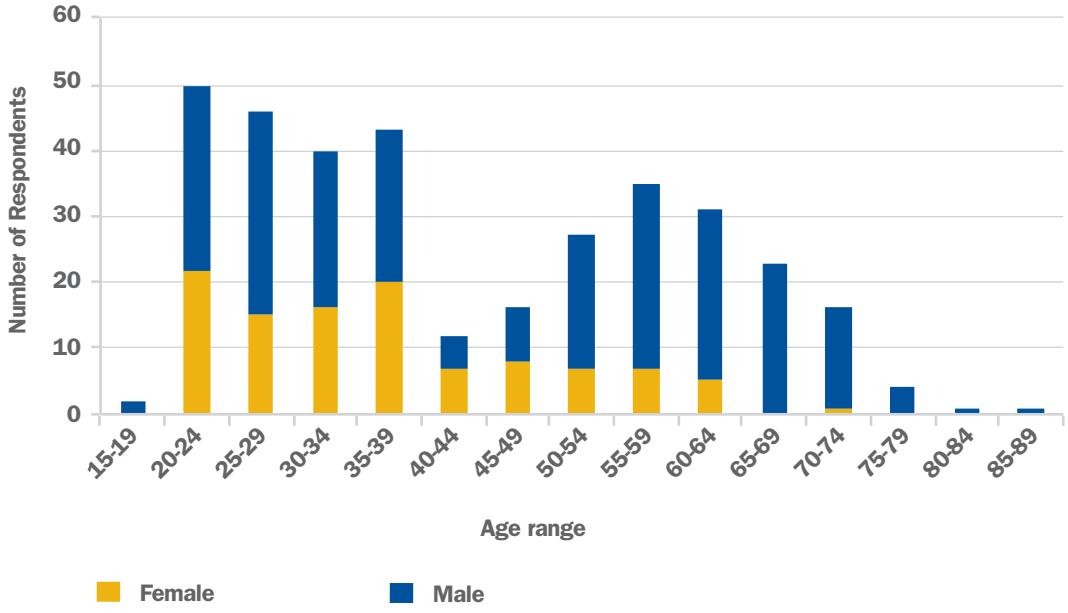
This is likely reflective of the higher average age of contractors compared to workers (Figure 46) and the decreasing proportion of female respondents with age. Women made up 40 per cent of survey respondents under the age of 50, compared to 16 per cent of respondents 50 and older (Figure 47).

Figure 46: Age of respondents for workers and contractors



Source: MiHR Exploration Survey, 2017

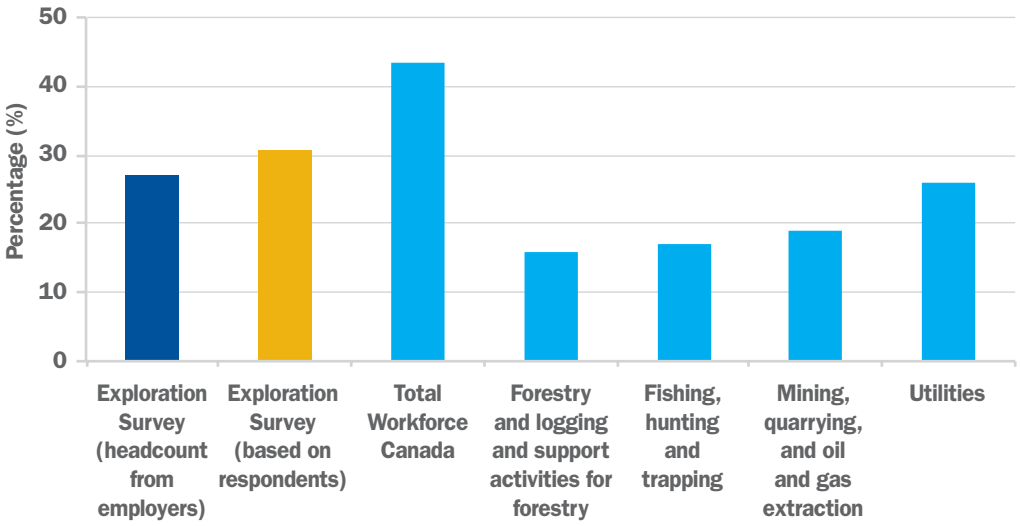
Figure 47: Age distribution of male and female respondents



Source: MiHR Exploration Survey, 2017

The responses from employers also suggest that female representation appears to be much higher in mineral exploration than in the mining industry. Data based on employers' self-reported headcount indicates a female representation rate of 27 per cent — further indicating the respondents of the survey are a representative sample for the mineral exploration industry in Canada (Figure 48). Although the rate of female representation is lower than the rate for the total Canadian workforce, it is much higher in mineral exploration than in other Canadian resource sectors.

Figure 48: Rate of female representation in the workforce for different industries compared to the survey response rate and headcount data provided by employers



Source: MiHR Exploration Survey, 2017; Statistics Canada, 2016

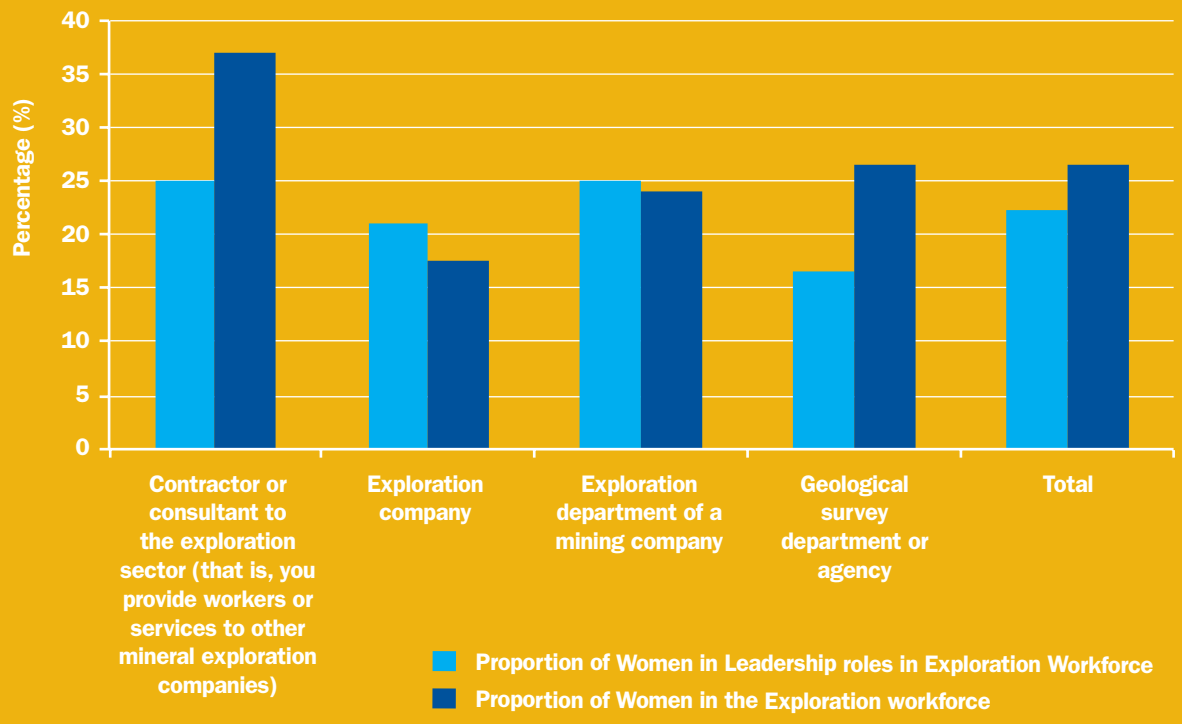
Source: MiHR

In recent years, the participation of women in the Canadian labour force has dramatically increased (Figure 47, Geoscientists Canada, 2017); however, women still face systematic barriers in breaking the glass ceiling. According to a recent report by Catalyst, in Canada, men are two to three times more likely to be in senior management positions compared to women. In the exploration survey, employers were asked about the total number of individuals in leadership positions and the proportion of women that held these positions.

As illustrated in Figure 49, survey results show that 22 per cent of the leadership positions from exploration employers surveyed are held by women. The Canadian exploration industry is 15 per cent below the national average when it comes to women in leadership positions.

In 2015, women held 20.5 per cent of all board seats and 37.1 per cent of all senior management positions in Canada (Catalyst, 2016). This under-representation of women in senior leadership positions could be attributed to the lower number of women in the exploration industry in general, compounded by the fact that the proportion of women in exploration drops significantly for people over age 50.

Figure 49: Proportion of women in senior leadership roles (responses from employers surveyed)

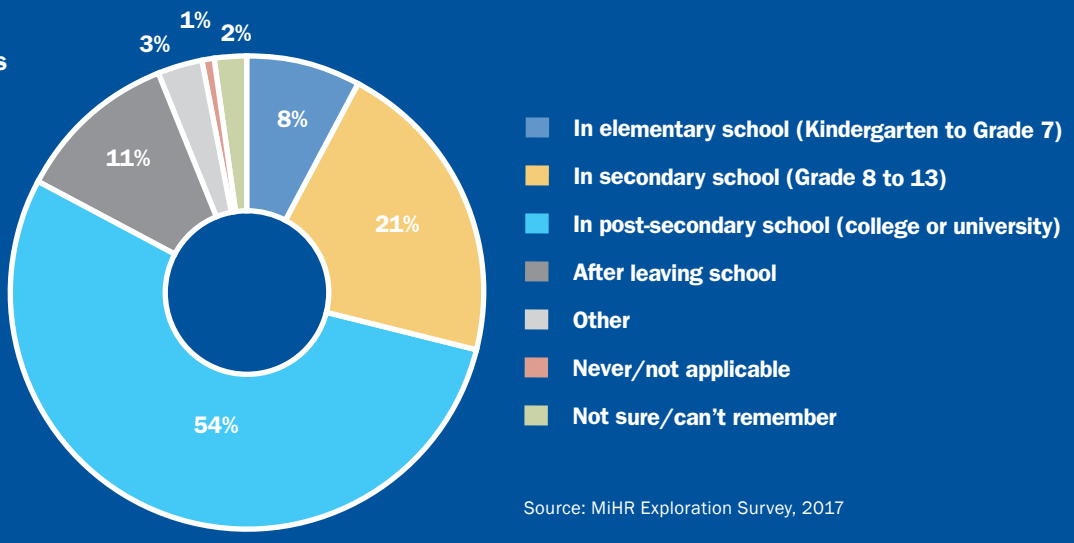


Source: MiHR Exploration Survey, 2017

Career Awareness and Attraction Issues

Over half of the respondents (54 per cent) indicated that they did not learn about careers in exploration until they were in a post-secondary school (college or university), with an additional 11 per cent learning about these careers only after they had left school (Figure 50). This research shows that most people who work in the industry were unaware of the opportunities that exist in mining and exploration when they graduated high school. Lack of career awareness creates a hurdle for the industry, as it limits the number of potential entrants to the job market, ultimately reducing labour supply.

Figure 50: When respondents first learned about careers in exploration



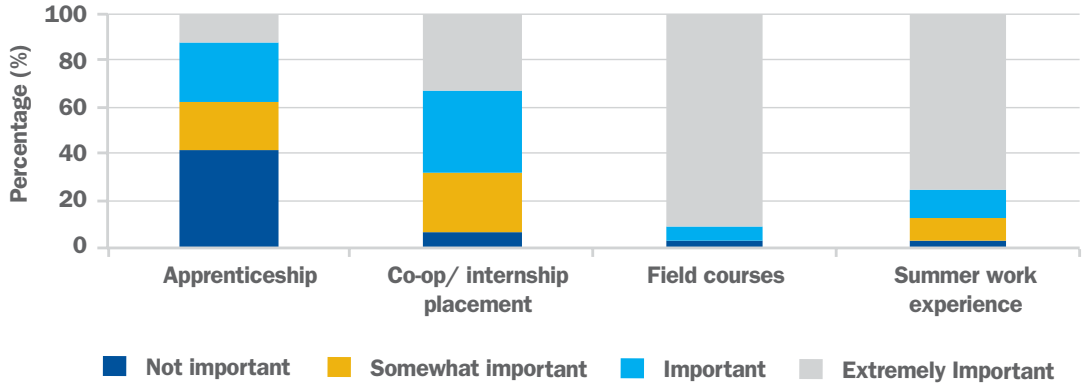
Source: MiHR Exploration Survey, 2017

As hiring requirements arise — whether from the creation of new positions or the need to replace workers who leave — the mining and exploration industry must ensure that there is a robust pool of individuals entering mining-related education and training programs. Promoting career awareness at elementary- and middle-school levels is essential; by the time students are in high school, they are already starting to decide their future career paths. These students may miss out on the chance to participate in the mining/exploration industry because they are not aware of the opportunities and careers that exist.

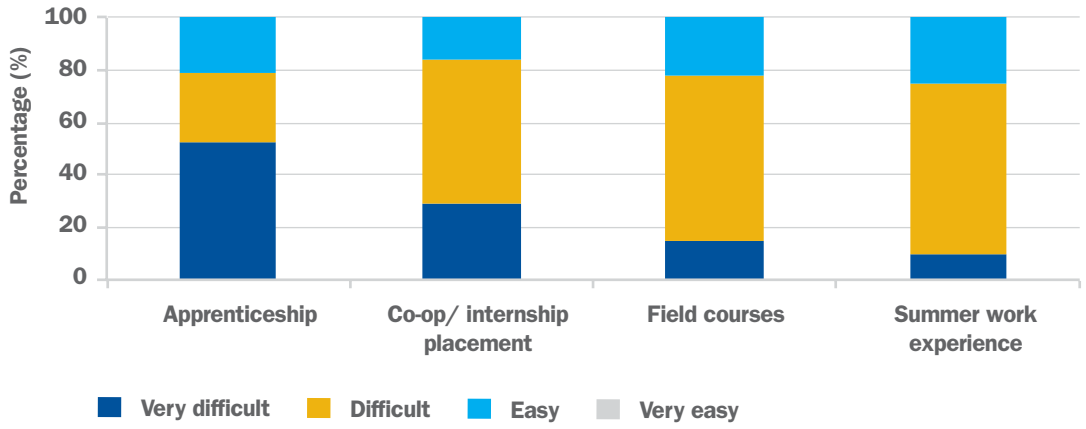
Better Collaboration between Industry and Educational Institutions

Educators in mineral exploration suggested that better coordination is needed between industry and education; a vast majority indicated that field courses and summer work experience were important (or very important) for students to take part in. However, they also indicated that it was difficult (or extremely difficult) to get industry to provide these opportunities for students (Figure 51). Although apprenticeships were not ranked as important as field courses or summer work experience, this does not indicate that apprenticeships are not important programs for student development. It could reflect the composition of the survey sample — with respondents overwhelmingly working in university environments where apprenticeships are seldom offered.

Figure 51: Educators' impression of how important it is for students to have the opportunity to participate in work-integrated learning and the ease of getting industry to offer these programs



How easy or difficult is it to get industry to provide the following?

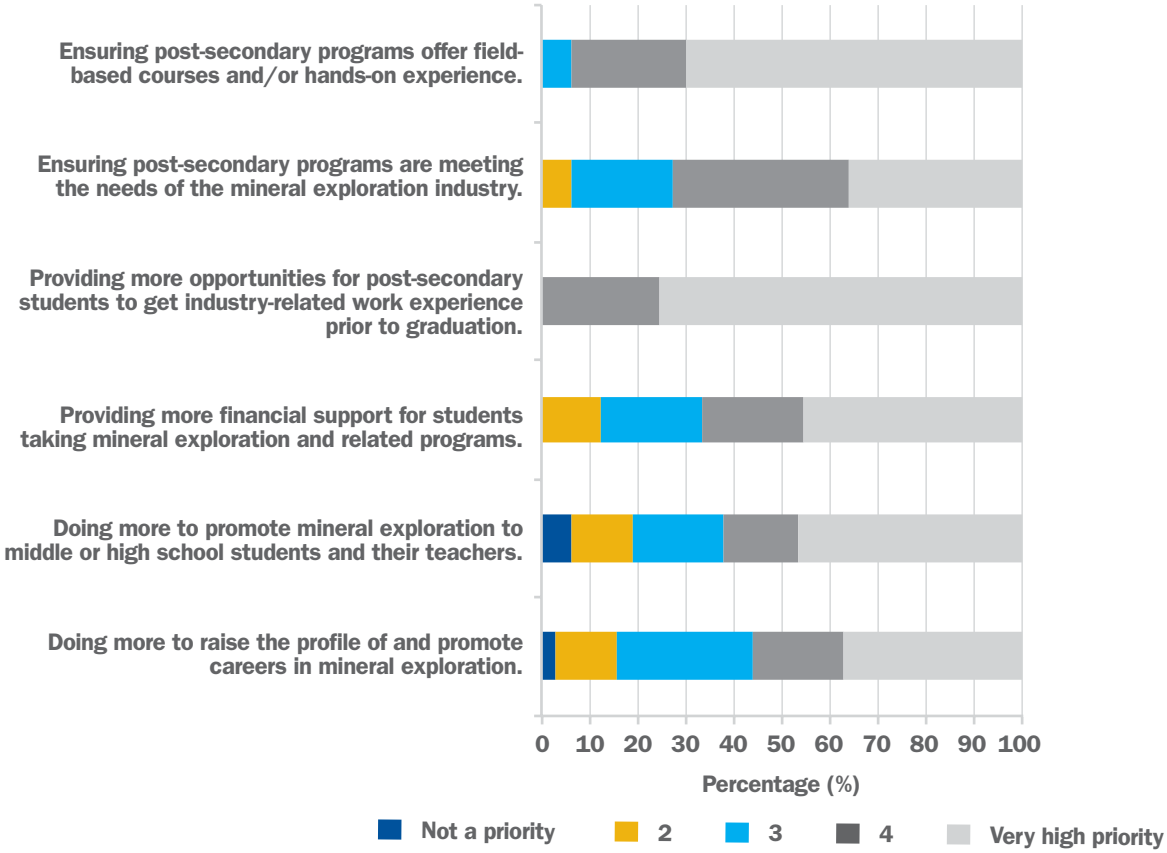


Source: MiHR Exploration Survey, 2017

The majority of the educators and students (>85 per cent) who responded to the survey indicated that a field-based course is part of the curriculum for their program. Although field school is a good starting point to gain field experience, a gap exists between this experience and the needs that employers have for workers with field experience. Field school is not a substitute for field work; however, the gap in experience can be bridged by ensuring that learning outcomes are more in line with employer requirements. This suggests that collaboration between industry and educational institutions is needed to ensure that students leave their post-secondary education with field-school experience that is both transferrable and applicable to working in mineral exploration.

Ninety per cent of educators who responded to this survey indicated it should be a high priority for programs related to mineral exploration to offer field-based courses and hands-on experience to students. However, all educator respondents indicated that a high or very high priority should be put on providing additional opportunities for post-secondary students to get industry-related work experience prior to graduation.

Figure 52: Responses from educators when asked "Thinking about the human resources needs of the mining exploration sector, please rate the priority that should be given to each of the following"

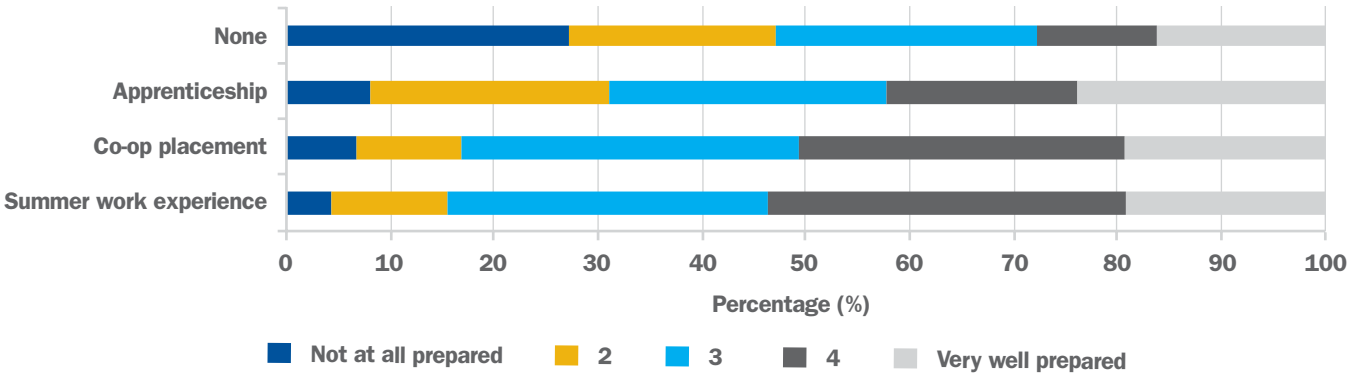


Source: MiHR Exploration Survey, 2017

When asked how well-prepared they were for work after graduation, respondents who had completed at least one form of outside training (summer work experience, co-op placements or apprenticeships) reported they were better prepared than those who had not completed such training.

Respondents who had summer work experience felt that they were the best prepared for work, followed by those who completed co-op placements and those who completed an apprenticeship (Figure 53). Overall, the people surveyed who did not participate in any work-integrated learning felt they were less prepared for work than those who did. This highlights the importance of offering educational programs designed to develop essential skills in partnership with industry, as education alone does not adequately prepare students for the working world.

Figure 53: Level of preparedness after leaving school compared to the type of work experience completed before graduation



Source: MiHR Exploration Survey, 2017

CONCLUSION

Source: PDAC

Assessment of the responses in the 2017 Canadian Mineral Exploration Survey provides new insights into the poorly understood and highly volatile mineral exploration industry. The survey responses from 397 people and organizations offer vital information on key aspects of the exploration industry that contribute to human resource and labour market challenges. Some of these issues cannot be mitigated; the exploration industry will always be cyclical because it is closely tied to commodity prices and the volatility of the stock market. However, this survey identified key areas for improvement, including increased collaboration between industry and educational institutions, and better career awareness.

In addition to challenges, the survey results indicate some positive aspects of the mineral exploration industry, including a much higher proportion of women and immigrants compared to the mining industry. It also showed that the mineral exploration industry in Canada is full of people that love doing field work and who are driven by the thrill of discovery.

All mining stakeholders — employers, government, educators, associations, and others — have a vested interest in optimizing the supply of labour, for today and tomorrow. A number of key observations arising from the data collected in this survey help increase our knowledge of the labour market realities and challenges facing mineral exploration in Canada. This pilot study on the exploration industry provided valuable information about the least-understood labour market in the mining industry. It would be valuable to undertake follow-up research on a regular basis, to continue to enhance our knowledge base about the ongoing changes occurring in the mining and mineral exploration labour markets.

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NOTES


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