

# British Columbia mineral and coal exploration survey

2017



Ministry of  
Energy, Mines and  
Petroleum Resources



# Foreword

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The *British Columbia mineral and coal exploration survey* is a joint initiative between the Government of British Columbia's Ministry of Energy, Mines and Petroleum Resources (EMPR), the Association for Mineral Exploration (AME) and EY. The survey has been conducted to provide a view of the current state of the mineral and coal exploration sector in BC.

The survey examines a wide range of economic, sociopolitical and organizational issues that impact companies and prospectors exploring in the province, and has been designed to provide previously unavailable insight into the mineral and coal exploration industry in BC. This 2017 report (and accompanying survey) follows on the back of the pilot study conducted in 2016 and looks at the progression of the sector year-over-year.

Data and analysis presented in this report are for the period 1 January through 31 December 2017 and are based on a survey that was completed<sup>1</sup> by 20 prospectors and 175 companies operating in BC. From the mining companies that adequately responded to the survey, 159 collectively represent 219 projects across the province.

Similar to last year, we note that for the 2017 calendar year, this survey replaces the annual EMPR mineral exploration expenditures survey, and for ease of completion it is designed to be similar to (though broader than) the Natural Resources Canada's (NRCAN) *Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures*.

## Thank you to our participants

A special thank you to the survey participants who spent their time and shared their information to continue to support us in this new endeavor of shedding light on the exploration sector in BC.

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<sup>1</sup> 98 respondents completed the survey online. However, only a portion were completed in a manner that allowed them to be included in this report. In addition, 114 participants were called directly by the EMPR regional geologists and British Columbia Geological Survey (BCGS) staff to gather key data points such as region and spend.



## About the collaborators

### EMPR

EMPR is the provincial government agency responsible for overseeing mineral and coal exploration activity in BC. Ministry staff helped in the design of the survey, facilitated response generation and collected additional information about exploration expenditures from companies and prospectors that did not complete the online survey. These expenditure data were either solicited directly from the companies and prospectors or estimated by the EMPR regional geologists and British Columbia Geological Survey (BCGS) staff under the direction of the BC Mineral Development Office.



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### AME

AME is the lead association for the mineral exploration and development industry based in BC. Established in 1912, AME represents, advocates, protects and promotes the interests of thousands of members who are engaged in mineral exploration and development in BC and throughout the world. AME encourages a safe, economically strong and environmentally responsible industry by providing clear initiatives, policies, events and tools to support its membership. AME's participation has facilitated the collection of previously unavailable insight into the industry.



Association for  
Mineral Exploration

### EY

With a volatile outlook for the sector, the global mining and metals industry is focused on how to maintain a strong and flexible balance sheet while preparing for future growth. The sector is also faced with the increased challenges of improving productivity, access to capital, dealing with increased transparency, maintaining license to operate and cybersecurity.

EY's Global Mining & Metals Network is where people and ideas come together to help mining and metals companies meet the issues of today and anticipate those of tomorrow by developing services/approaches to meet these challenges. It brings together a worldwide team of professionals to help you succeed – a team with deep technical experience in productivity improvement, capital management, innovation and digital, tax and transactions to the mining and metals sector. Ultimately it enables us to help you meet your goals and compete more effectively.



Building a better  
working world




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### Disclaimer

- ▶ EY has relied upon unaudited financial information provided by mineral and coal exploration companies and prospectors in BC, third party research, and information provided by other data sources and relevant associations and bodies. EY has not audited, reviewed or otherwise attempted to verify the accuracy or completeness of such information.
- ▶ Financial information referred to in this report was prepared based on figures provided by entities, estimates and assumptions. As such, readers are cautioned that variations between estimations and actuals could be material.
- ▶ Unless otherwise stated all monetary amounts contained herein are expressed in Canadian dollars.
- ▶ EMPR staff assisted in the collection of survey data and information. Specifically, where a response was not received directly from a company through the online survey, key points of data were either solicited directly from the companies and prospectors themselves or estimated by the EMPR regional geologists and British Columbia Geological Survey (BCGS) staff under the direction of the BC Mineral Development Office and through use of professional opinion and experience.
- ▶ Where exploration projects were known to exist but were deemed to have expected expenditure of less than \$10,000 in the 2017 calendar year, individual project data was not specifically sought.



For the second year, we are pleased to present the findings of the 2017 *British Columbia mineral and coal exploration survey*. Data and analysis presented in the survey are based on information collected from 20 prospectors and 175 mineral and coal exploration companies operating in BC. Collectively, these companies represent 219 exploration projects across the province.



Following years of decline, global exploration budgets increased by more than 14% in 2017 – the first increase in annual exploration budgets since 2012. This increase is in line with rising, or at least stable, commodity prices since 2016.<sup>2</sup> Globally, gold has led the way, accounting for 73% of the year-on-year increase in worldwide exploration expenditure.

Many of the exploration trends observed globally were also experienced in BC in 2017. With an improved commodity price outlook, a stabilizing Canadian market and renewed vigor in the economy, the BC mineral and coal exploration industry grew for the first year since 2012. Province-wide exploration spend of \$246 million in 2017 was up \$41 million, or 20%, from 2016.

Analysis of survey data identified a number of key figures, insights, themes and observations for 2017:

- ▶ Gold accounted for 87% (\$37 million) of the increase in total exploration expenditure in BC, led by:
  - ▶ The “Golden Triangle,” located in the province’s Northwest, which experienced an \$11 million increase in expenditure over the prior year to \$82 million in 2017. Recent important infrastructure upgrades – including the Stewart-Cassiar Highway, new ocean port facilities at Stewart and a new high-voltage transmission line – have been catalysts in the increase in gold (and silver) exploration in the region.
  - ▶ The historic Cariboo gold belt of the province’s interior, where gold exploration expenditure increased by \$19 million, or 70%.
- ▶ Exploration expenditure on primary-silver projects more than doubled to \$9.8 million, almost all which occurred in the Golden Triangle.
- ▶ Zinc exploration rebounded in BC in 2017, up by almost 50% to \$8.2 million and in line with increasing zinc prices. Expenditure on other base metal exploration – including copper, molybdenum and nickel – was generally in line with 2016 levels.
- ▶ Exploration expenditure was likely inhibited by the historically intense and prolonged wildfire season that was felt across the province and particularly in South Central BC, leading to project shutdown or delay and shifting of activity to safer regions.
- ▶ From a regional perspective, the province’s Northwest and Southeast regions accounted for more than three quarters (77%, or \$33 million of \$41 million) of the increased exploration expenditure in the province in 2017, almost entirely due to the aforementioned increase in exploration activity in their respective gold and silver producing regions.
- ▶ In contrast, a steep decline in coal exploration expenditure in 2017 had a disproportionately adverse impact on the province’s Northeast region, where exploration spend declined by almost 75% to \$2.4 million, almost entirely due to coal.

<sup>2</sup> Corporate Exploration Strategies 2017, S&P Global Market Intelligence.

- The hypothesis of the 2016 *British Columbia mineral and coal exploration survey* report was that the sector was embarking on a mining lifecycle “reset.” Analysis of 2017 data supports this view. Last year’s survey found 41% of exploration activity was focused on grassroots exploration, while only 23% of 2017 activity was grassroots. In 2017, more than 60% of exploration activity was early or advanced stage exploration (the second and third exploration stages), compared to only 44% in 2016. This suggests that greater levels of activity are still occurring in the initial three stages of the mining lifecycle, though greater progression to stages two and three when compared to 2016 levels. Notably, expenditure doubled to \$188 million for those projects with exploration activity in both 2016 and 2017.
- Drilling activity has increased in line with increased early stage and advanced stage exploration. Metres drilled more than doubled, from approximately 300,000 metres in 2016 to more than 600,000 in 2017. Drilling specific for coal declined as a share of total metres drilled, from approximately 9% in 2016 to 1% in 2017.

- Exploration companies continued to demonstrate their commitment to local communities and working with First Nations land claims. Of those who responded, they noted they continue to invest and source resources from local or surrounding communities and engage with First Nations through targeted activities.

Looking forward, a number of factors recently experienced in BC will likely continue to influence exploration activity in the province in 2018 and beyond. These include a strengthening economy, a stable price outlook, and the prolonged wildfire season of 2017. Further, the impact of the 2017 provincial election, the provincial government’s decision not to issue an environmental assessment certificate for the KGHM Ajax mine project, the Tsilhqot’in decision and Nenqay Deni Accord are waiting to be seen.

Figure 1 below highlights key statistics and figures for 2017 across all BC regions and shows the growth (or otherwise) when compared to the 2016 survey findings.

**Figure 1:** Exploration in BC summary statistics

		BC	Northwest	Northeast	North Central	Southwest	South Central	Southeast
Regional centre			Smithers	Prince George	Prince George	Vancouver	Kamloops	Cranbrook
<b>Projects</b>								
2017 projects	#	219	61	4	29	21	43	61
2016 projects	#	259	79	10	47	26	35	62
% Year-on-year change	%	-15%	-23%	-60%	-38%	-19%	23%	-2%
Share of 2017	%		28%	2%	13%	10%	20%	28%
<b>Expenditure</b>								
2017 expenditure	\$m	246	99	2	31	9	61	43
2016 expenditure	\$m	205	84	9	29	2	44	37
% Year-on-year change	%	20%	18%	-78%	7%	350%	39%	16%
Share of 2017	%	100%	40%	1%	13%	4%	25%	18%
<b>Drilling</b>								
2017 total drilling	m	626,897	274,077	2,830	32,353	10,600	237,591	69,446
2016 total drilling	m	290,702	115,230	2,866	34,474	3,809	102,982	31,241
% Year-on-year change	%	116%	138%	-1%	-6%	178%	131%	122%
Share of 2017	%	100%	44%	0%	5%	2%	38%	11%

# British Columbia's mining and coal exploration sector

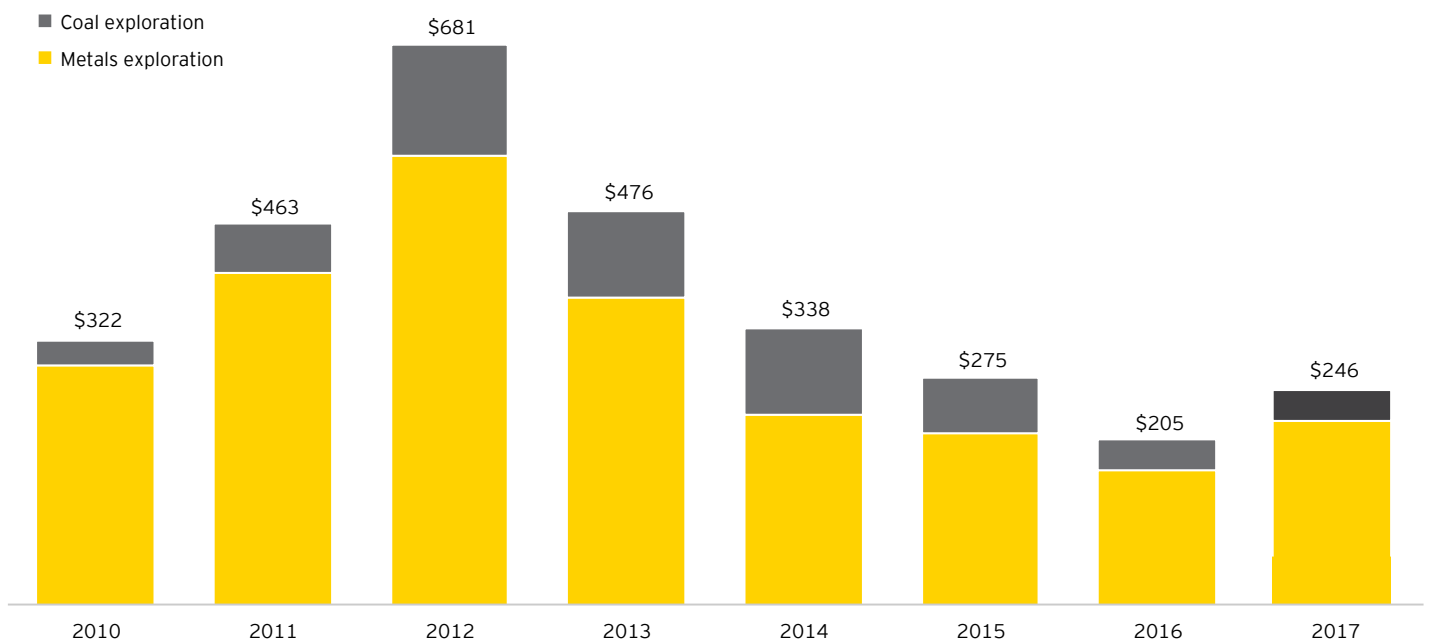
## Exploration is a key driver of BC's economy

The mining industry plays a significant role in the health of BC's economy. Each year, the mining industry directly invests billions of dollars locally in goods and services. The economic benefits of mining extend beyond this direct spending, however, since the purchase of these goods and services induces further purchasing. Overall, gross mining revenues are estimated to approach \$9 billion per annum. Foundational to a continued robust mining industry in the province is a healthy exploration industry – the source of new mine development opportunities.

## In 2017, exploration expenditure bucked the declining trend and grew by 20%

Our 2017 survey of mineral and coal exploration expenditure in BC identified an annual increase in expenditure for the first year since 2012. Compared to 2016, the sector's level of expenditure grew by 20% to \$246 million. Although still considerably down from the peak years of 2011-12 (Figure 2), there is cause for optimism that the upward trend will continue given the outlook for continued price stability, an overall strengthening of global market sentiment towards exploration, improvements in the capital markets for financing mineral and coal exploration and a more favorable future market outlook

Figure 2: Annual exploration expenditure in BC between 2010-17 (\$ millions)<sup>3</sup>

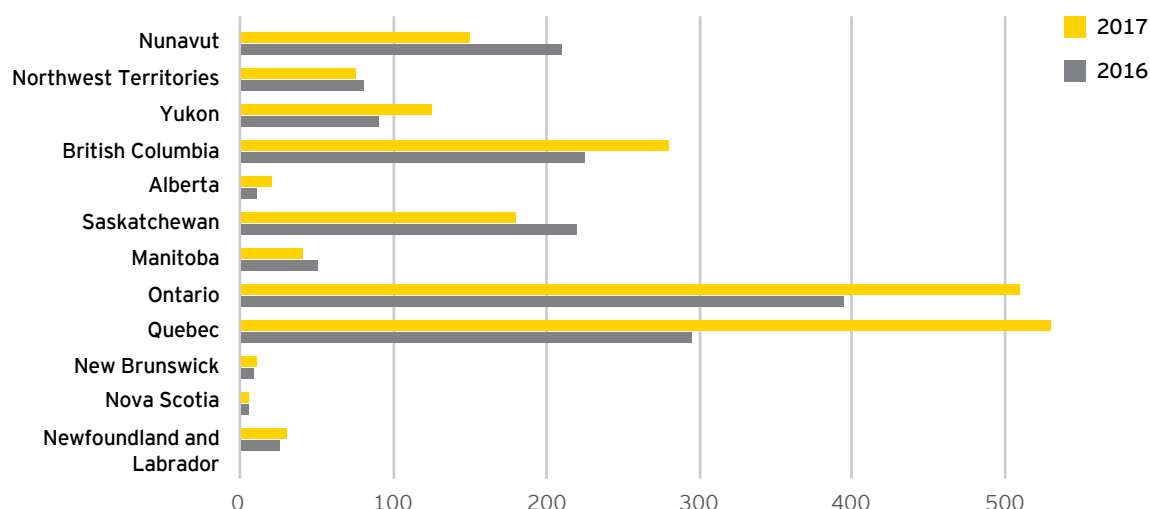


<sup>3</sup> 2010 to 2015 data per EMPR provided data. Note Industrial Minerals included in metals.

## Across the nation, BC's share of exploration has held steady

On a national basis, BC's share of exploration spend held steady at 14.1% of national mineral exploration and deposit appraisal expenditures.

Figure 3: Exploration plus deposit appraisal expenditures by province (\$ millions)



Source: Natural Resources Canada (2017), Table 27: Exploration Plus Deposit Appraisal Expenditures, by Province and Territory, 2016 Annual, 2017 Revised Spending Intentions.

## Metals exploration drives expenditure in 2017

Survey respondents once again identified a wide variety of commodities of interest, including many different industrial minerals, with gold, silver and copper continuing to take top billing.

Exploration expenditure was incurred through 191 projects in 2017 (as reported by survey respondents). Although this represents a 20% decrease on the prior year in terms of the number of projects with reported expenditure, the average exploration spend by project *increased* by more than 50%. When we exclude prospectors from the analysis, the \$42 million increase in year-on-year company exploration spend resulted from:

- ▶ A \$46 million increase (29%) in metals exploration due to rising, or at least stable, commodity prices.
- ▶ A \$3 million increase (58%) in industrial minerals exploration, driven by strong performance in jade, marble, limestone exploration activity.
- ▶ And a \$7 million decrease (18%) in coal exploration.



## Gold leads the way

Globally, gold accounted for almost three-quarters of the year-on-year increase in worldwide exploration expenditure in 2017. This trend was also experienced in BC, where gold exploration spend was up by 32% to \$151 million in 2017. The increase in gold expenditure accounted for 87% of the total increase in exploration expenditure experienced in the province in 2017 (Figure 4).

Gold was the number one primary target (out of 38 possible targets) for nearly 40% of respondents, and was indicated as a commodity of interest by 65% of companies that indicated a commodity focus (Figure 5). This represents an increase of 10% over the prior year.

Figure 5: Prioritization of ores related to project

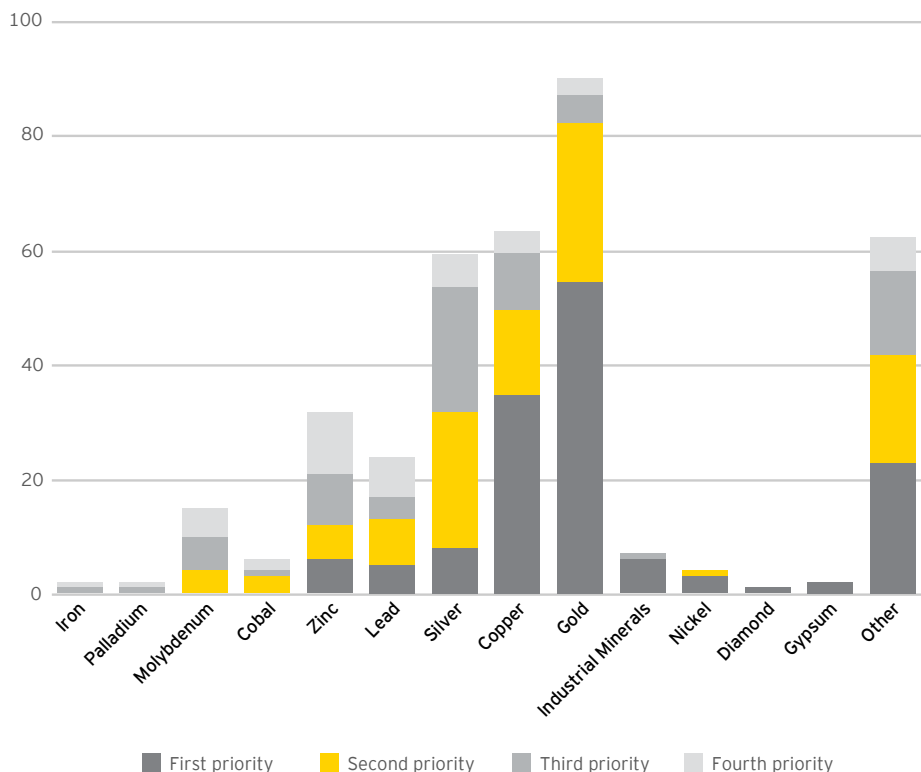
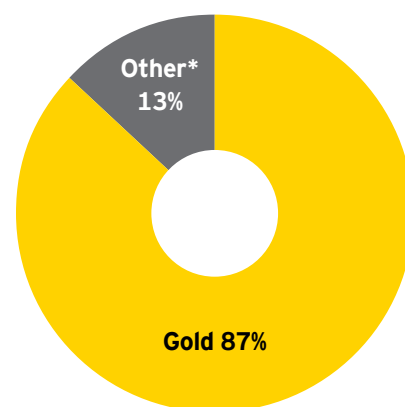


Figure 4: Share of exploration spend increase in BC in 2017 (%)



\*Silver, other metals, industrials and coal

Of the increase in gold exploration expenditure in BC, 80% was incurred in the South Central and Northwest regions of the province. These regions are home to the historic Cariboo gold belt of the province’s interior and the Golden Triangle, located in the province’s Northwest (see Figure 6 and Figure 7).

Figure 6: The Golden Triangle

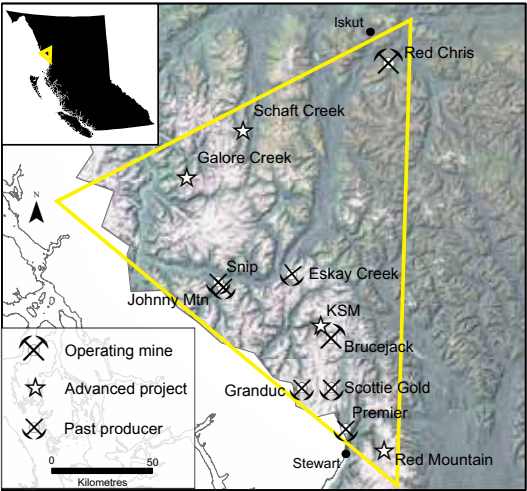
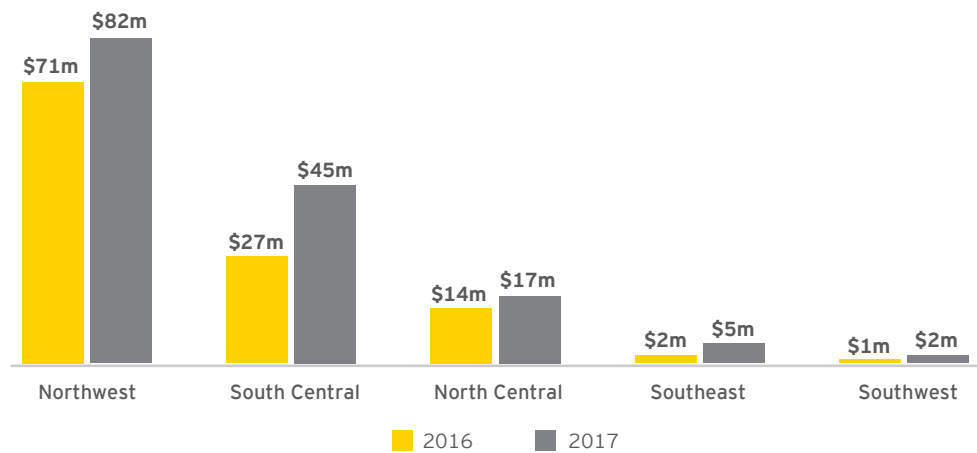


Figure 7: Cariboo gold region



It’s speculated that the increased exploration activity in the Golden Triangle has been enabled by three very important infrastructure upgrades in the region: the paving of the Stewart-Cassiar Highway, the opening of ocean port facilities for export of concentrate at Stewart and the completion of a \$700 million high-voltage transmission line to bring power into the Golden Triangle.

Figure 8: Gold exploration expenditure by provincial region in 2016 versus 2017 (\$ millions)



Almost all of the increase in spending in gold exploration in BC has been derived from existing projects; that is, those projects with exploration activity and expenditure in both 2016 and 2017. Expenditure at the 33 gold projects active in both 2016 and 2017 increased by \$34 million in 2017 (Table 1). This observation illustrates the level of increased intensity of activity and therefore spend of exploration projects as they advance.

Table 1: Gold exploration expenditure by year by project status (\$ millions)

Gold project description	#	2017	2016	Variance
Project with exploration spend in both 2016 and 2017	33	\$124	\$90	\$34
Project with exploration spend in 2017 only	47	\$27	\$ -	\$27
Project with exploration spend in 2016 only	79	\$ -	\$24	\$ -24
<b>Total</b>		<b>\$151</b>	<b>\$114</b>	<b>\$37</b>

## Base metals maintain around a 20% share of exploration spend

After gold, base metals (copper, lead-zinc, nickel) exploration represents the second largest metal and mineral target in BC. Base metals exploration expenditure of \$44 million in 2017 represents a 6% increase (\$2 million) on 2016 levels. Globally, expenditure on base metals exploration increased by 11%.

Figure 9: Base metals exploration expenditure 2016-2017 (\$ millions)

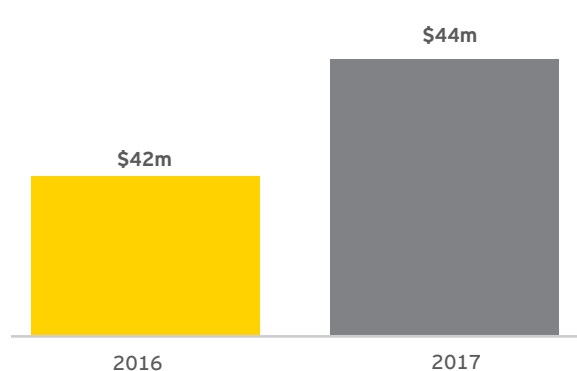
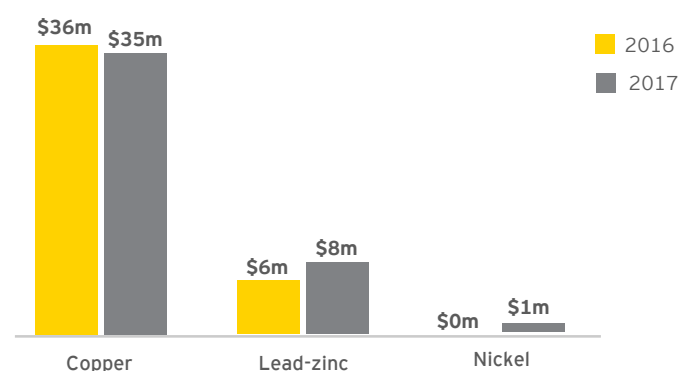


Figure 10: Base metals exploration expenditure by base metal 2016-2017 (\$ millions)



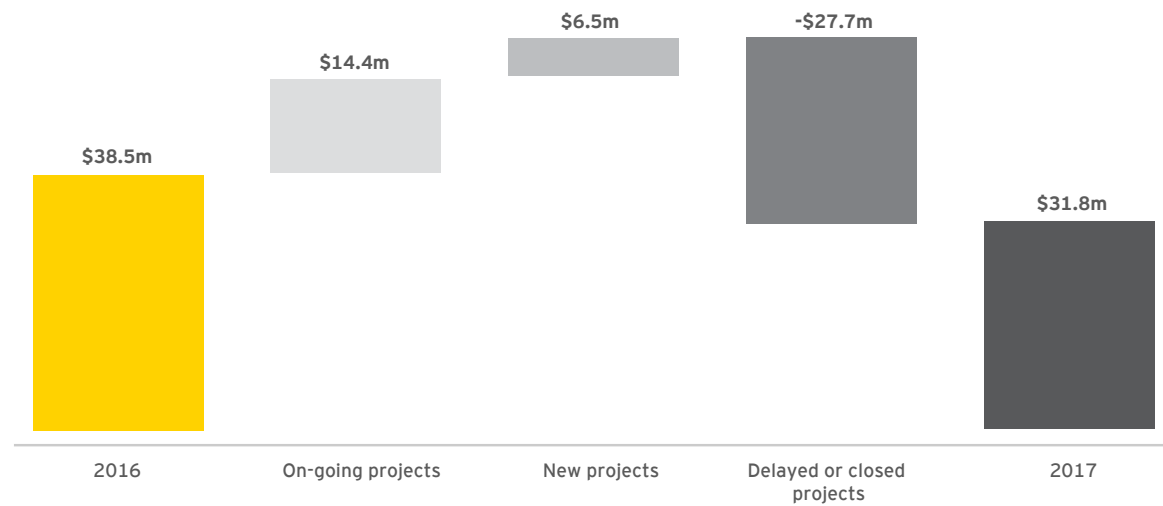
Copper accounted for the vast majority (80%) of base metals exploration in BC in 2017. This is higher than copper's 69% share of base metal exploration globally in 2017.

Zinc exploration in the province rebounded in 2017, up 46% year-on-year to \$8.2 million, as zinc prices continue their upward trend since mid-2015. The step-change in exploration expenditure was experienced globally. Zinc increased its share of base metals budgets to 20%, its largest since 2001. In BC, zinc's share of base metals expenditure increased from 13% in 2016 to 18% in 2017.

Coal sees decline in 2017

Exploration expenditure on coal dropped in BC. Total expenditure of \$31.8 million was down 20% (\$6.7 million) on prior-year figures. Notably, of the 17 coal projects with exploration expenditure in 2016, only 7 continued to spend in 2017. On a positive note, these 7 projects increased their spending by 130% from \$10.8 million to \$25.2 million. This increase, however, was more than offset by the 10 projects active in 2016 that did not continue spending in 2017 – representing a decline from \$27.7 million in 2016 to zero in 2016. Three new projects account for the remainder of change in coal exploration expenditure from 2016 to 2017. Large percentage swings in coal are not unusual as the sample base is small.

Figure 11: Reconciliation of coal exploration expenditure from 2016 to 2017 (\$ millions)



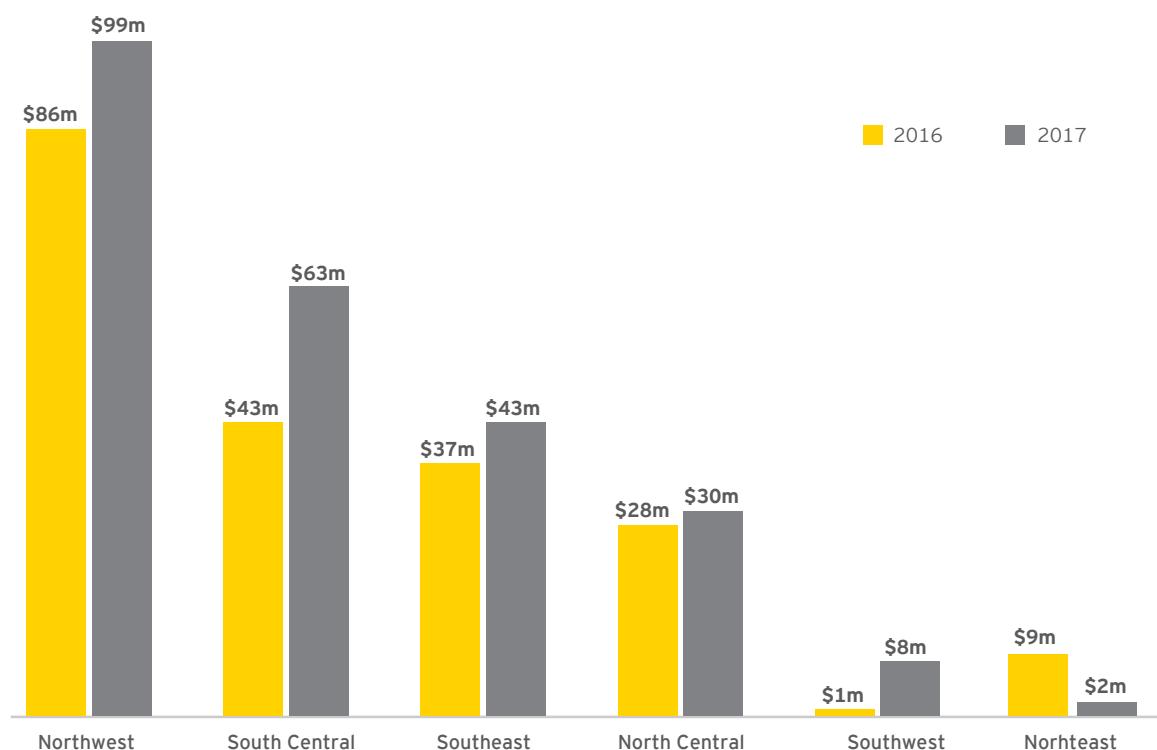


## The Northwest region continues to attract the most exploration spend

The Northwest region attracted 40% of total exploration expenditure in the province in 2017. The region experienced a 20% increase in exploration expenditure and a 138% increase in drilling (as measured by metres) over 2016. This positive news demonstrates the continued quality of the exploration projects in the Golden Triangle and the benefits of the province's investment in infrastructure in the region.

Exploration projects continue to draw attention, such as the recent news that Skeena Resources Limited has purchased the past-producing Eskay Creek (precious metal-enriched VMS deposit) and Snip gold mines from Barrick Gold Corporation in the fall, as well as Barrick's \$1 million investment in Skeena.

Figure 12: Exploration expenditure by region 2016-17 (\$ millions)



Like the Northwest region, exploration activity in the province's South Central region is driven by gold, silver and copper. The South Central region attracted the second-highest level of exploration expenditure in BC in 2017 (26%).

Almost 40% of reported exploration projects are based in the province's Southeast. The Southeast is arguably the province's most diverse region in terms of mineral interests, with more than 20 different commodities listed by survey respondents as a primary focus, including zinc, lead and gypsum. However, the region accounted for 18% of total expenditure due to an average spend-per-project that is lower than that experienced in the Northwest and South Central.

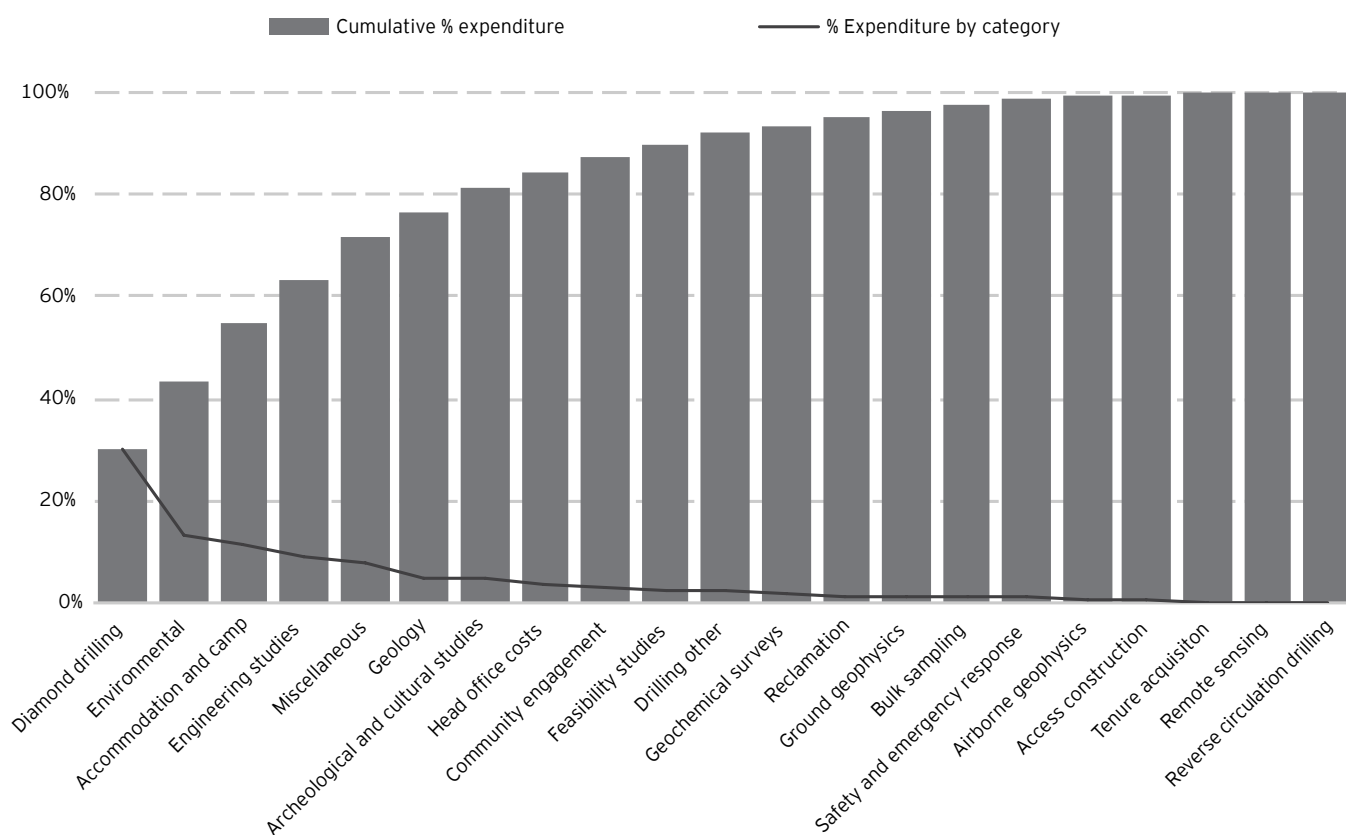
**Table 2: Gold exploration expenditure by year by project status (\$ millions)**

	Northwest	South Central	Southeast	North Central	Southwest	Northeast
Gold	82.1	45.2	5.5	16.6	1.6	0.0
Silver	8.3	0.0	1.5	0.0	0.0	0.0
Copper	7.9	14.8	1.1	10.3	1.0	0.0
Zinc/Lead	0.1	0.3	5.6	2.2	0.0	0.0
Coal	0.0	0.0	25.0	0.0	4.5	2.2
Other	0.6	2.4	4.6	1.3	0.5	0.2
<b>Total</b>	<b>99.0</b>	<b>62.6</b>	<b>43.3</b>	<b>30.4</b>	<b>7.5</b>	<b>2.4</b>

## Diamond drilling was the most significant expenditure item

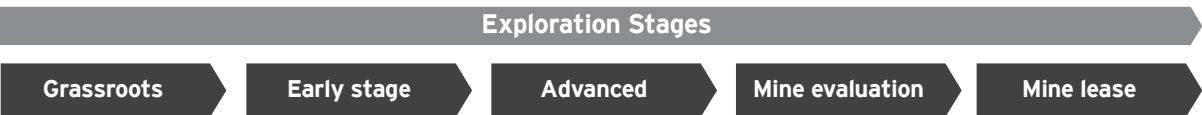
From those companies that provided expenditure data for major cost activities, diamond drilling was by far the largest expenditure item, accounting for 37% of total expenditures. This activity cost on average \$1.6 million per project and was used in approximately one-third of all projects. Environmental costs followed as the second-highest expenditure item, garnering half the expense of diamond drilling and accounting for 16% of total expenditure. For those who indicated this as a cost item, total environmental costs equated to an average of approximately \$1.2 million per project.

Figure 13: Exploration expenditure allocation in 2017



The start of a new mining cycle

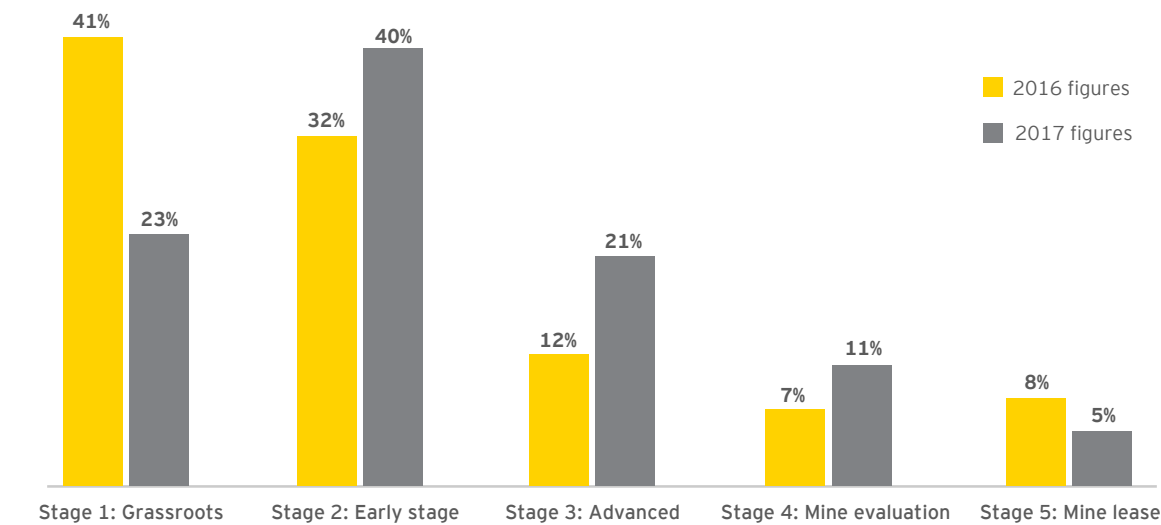
The exploration lifecycle consists of five core stages as demonstrated in the graphic below.



In last year’s *British Columbia mineral and coal exploration survey*, it was speculated that the sector was embarking on a mining lifecycle “reset.” Although it will take a few years before this hypothesis can be validated or refuted, 2017 data does support the premise.

Whereas last year’s survey found 41% of exploration activity was focused on grassroots exploration, only 23% of 2017 activity was grassroots. But, more than 60% of exploration activity was early or advanced stage exploration (the second and third exploration stages). Notably, expenditure doubled to \$188 million for those projects with exploration activity in both 2016 and 2017, suggesting projects’ advancing stages.

Figure 14: Distribution of exploration activity by stage 2016 and 2017

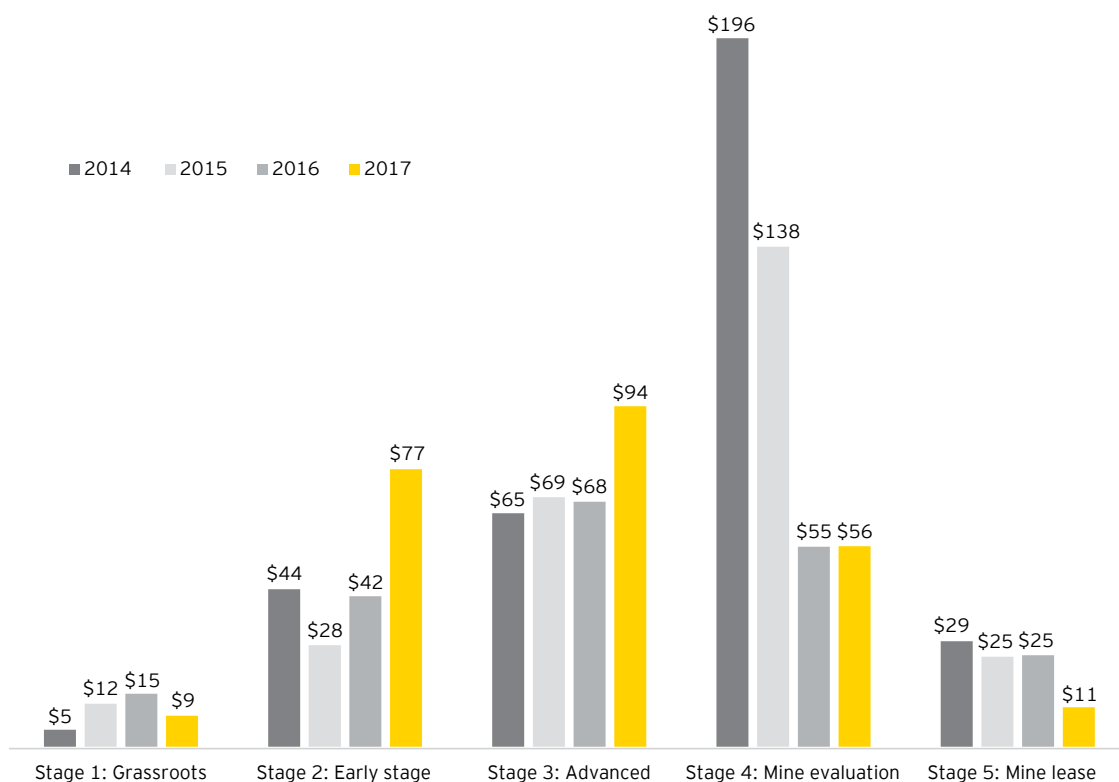


Aligned with activity undertaken, early stage project activities incurred the largest level of spend. While grassroots and advanced stages accounted for nearly the same level of activity, advanced-stage activities clearly incur higher costs, with the majority of exploration spend occurring in stages 2 through 4 (Figures 14 and 15).



Figure 15 shows the changing pattern in expenditures across the stages and is consistent with last year's result of a resetting sector that continues to see projects progress through the main stages of the exploration cycle each year. Namely, a bulk of growth was seen in the early stage, with growth also being seen in the mine evaluation stage. This growth in the latter stage, however, may be explained by the increasing market sentiment and the resulting decision made by producers to invest in, or re-evaluate, proposed mines.

**Figure 15: Distribution of exploration expenditure by stage between 2014-17 (\$ millions)**



# Prospecting in BC

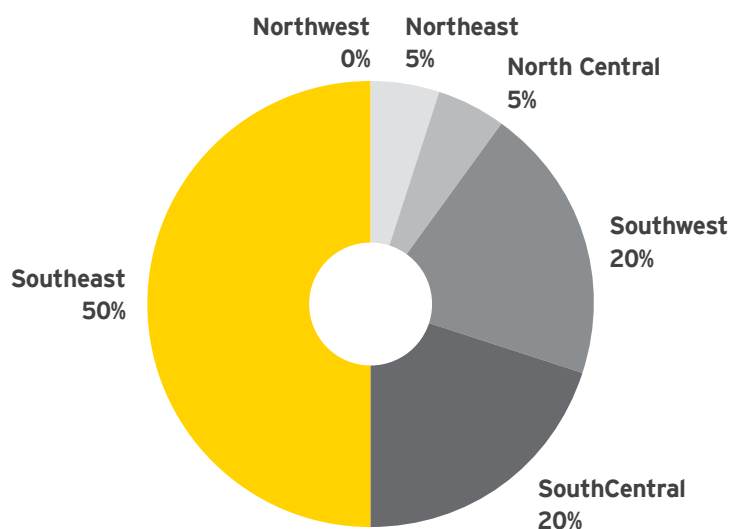
## Prospectors spent just over \$300,000 collectively across the province in 2017

Survey information was collected from 20 prospectors in this year's survey, most of whom operated in the Southeast region. There were 10 fewer prospectors responding this year, and the small number of overall prospectors is a limitation of this survey, as it therefor has not captured activity and exploration projects as accurately as in 2016.

Tracking prospectors is notoriously difficult, and many prefer not to disclose work, so it is unclear whether the drop-off in response rate is due to prospectors' lack of response, or evidence of a trend in prospectors retiring and fewer new players entering the field. The intense wildfire season may have kept many otherwise interested prospectors out of the bush in some areas.

Dissimilar to exploration companies, prospector spend has decreased, with the average annual spend from each prospector in 2017 being just over \$18,000, while in 2016 that figure was near \$59,000.

Figure 16: Regions frequented by prospectors 2017



Aligned with this focus, the Southeast region also commanded the greatest level of spend, accounting for over 60% of total prospector expenditure.

With regard to commodities, gold remains the most searched-for commodity, followed closely by silver, lead and copper. This is illustrated in Figure 19, which shows the number of times a particular commodity ranked in the top three across the prospectors who responded.

**Figure 17: Share of 2017 prospector expenditures**

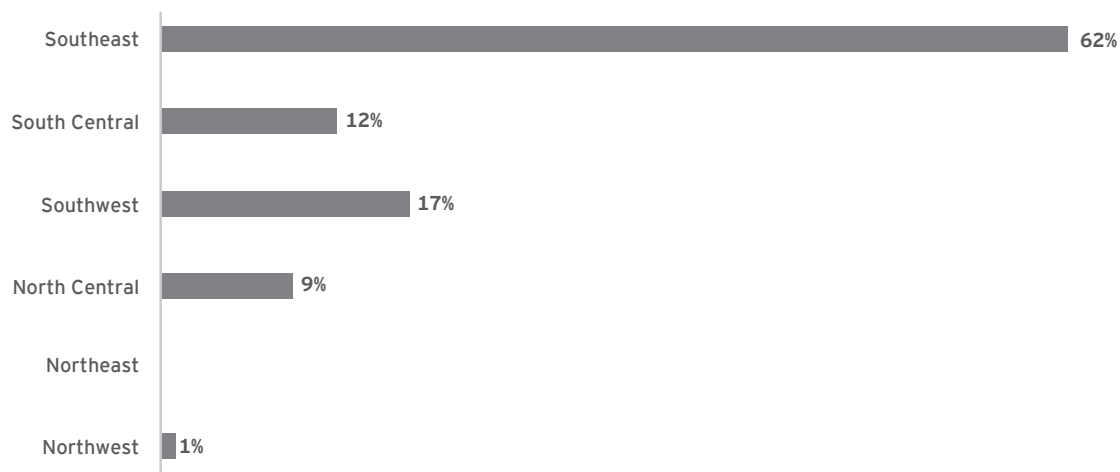
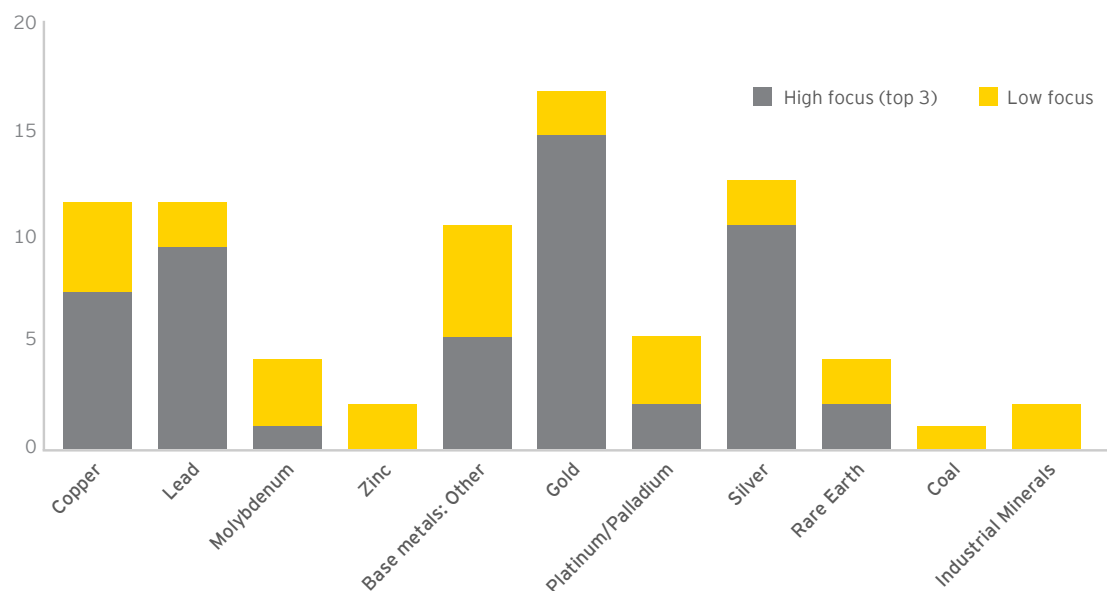


Figure 19 illustrates the total number of times a commodity was prospected. Coal, zinc and industrial minerals were not indicated as a priority commodity for any of the prospectors surveyed. The number of prospectors indicating lead as a top 10 commodity has increased when compared with last year, as has lead's relative importance, with more prospectors indicating it was their second, or even their first priority. This may reflect the greater reporting from the Southeast region, where the Sullivan Pb-Zn mine operated until 2001.

**Figure 18: Top 3 prospected commodities (2017)**



# Contact us

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Should you require any information regarding this report and its contents, please contact the relevant organization through the following representatives:

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