

CHIEF INSPECTOR OF MINES

2016

ANNUAL REPORT



Ministry of
Energy, Mines and
Petroleum Resources

A Message from the Chief Inspector of Mines

December 31, 2017

Eight metal mines and seven coal mines were in production across B.C. in 2016, directly employing approximately 7,500 workers. Their economic spinoff generates hundreds of millions of dollars for local communities and keeping workers on the job is a government priority.

2016 was a challenging year for British Columbia's mining industry. Globally, the mining and mineral exploration industry experienced a significant downturn, and B.C. wasn't immune to this reality. Low copper and coal prices put operations at a number of British Columbia mines at risk. The Province addressed the downturn in the sector in early February by allowing mining companies to temporarily defer a portion of their BC Hydro utility bills.



The Mines and Mineral Resources Division received a budget lift that resulted in a number of high profile projects being completed and included the hiring of new mines and permitting inspectors. These new members of the inspectorate will be working to improve permitting times and ensuring there are more inspections of mine sites throughout the province.

The *Mines Act* was amended in February to strengthen government's regulatory oversight of the industry and to give our ministry additional compliance and enforcement tools. These changes include the ability to charge administrative monetary penalties.

In May, the Office of the Auditor General released An Audit of Compliance and Enforcement of the Mining Sector. The report's 17 recommendations have been accepted by government despite disagreement with some of its findings. Government also established the Deputy Ministers Mining Compliance and Enforcement Board (Board) comprised of the Ministries of Environment and Energy, Mines and Petroleum Resources and the Environmental Assessment Office.

Changes to the Health, Safety and Reclamation Code for Mines in British Columbia announced in July have put B.C. at the forefront of global standards for the safety of tailings storage facilities. For the first time, First Nations also participated in a review of the Code and having this input, which reached consensus, resulted in positive changes and an outstanding final product that was recognized by the Mining Journal. The review targeting health and safety portion of the Code began in late summer and continued through the rest of 2016.

Officials with the governments of British Columbia and Alaska signed an agreement in October 2016 establishing a bilateral working group that will build on and enhance water quality monitoring, environmental assessments and permitting relating to trans-boundary mines and development in both jurisdictions.

Overall, 2016 was a very busy year as we implemented policy changes and met the challenges of low commodity prices head on. We were particularly pleased that no mine operating fatalities occurred... a trend that has been improving steadily over the past few years.

Sincerely,
Al Hoffman
Chief Inspector of Mines

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Cover photo credit: Greenhills Operations, Teck Resources

About the Office of the Chief Inspector of Mines

The Office of the Chief Inspector of Mines is located in Victoria and the chief inspector is also the executive director of the Health, Safety and Permitting Branch of the Mines and Mineral Resources Division of the Ministry of Energy, Mines and Petroleum Resources (EMPR). As a result of the auditor general's report, [An Audit of Compliance and Enforcement of the Mining Sector](#), a deputy chief of mines, compliance and enforcement position was introduced in 2016.

The branch has five regional offices located in Cranbrook, Kamloops, Prince George, Smithers, and Victoria. A new position, executive director of operations, was created in 2016 to oversee regional operations. Regional directors are responsible for operations in their regions.

Mandate

The Health, Safety and Permitting Branch's primary purpose is to ensure worker health and safety, public safety, and reclamation and protection of the land and watercourses affected by mining and exploration in B.C. The branch administers and regulates the full mining cycle, including exploration, development, production, reclamation and closure for metal, placer, industrial mineral and coal mines, and gravel pits and quarries.

The [Mines Act](#) and the [Health, Safety and Reclamation Code for Mines in British Columbia](#) (the Code) specify the legal responsibilities mining companies operating in this province have regarding meeting this mandate, and also protect workers and the public through provisions for minimizing health, safety, and environmental risks related to mining activities.



Key Functions

- Regulate all mines in B.C.
- Review applications and issue permits
- Conduct regular mine inspections, compliance reviews and enforcement activities
- Review mine emergency preparedness plans
- Establish geotechnical and reclamation standards
- Ensure financial securities adequately mitigate risks and reflect mine site reclamation liabilities
- Liaise with mine management, unions and workers, occupational health and safety committees, communities, First Nations, and other technical organizations, committees, and government agencies
- Support research, development and ongoing training to enhance best practices and promote new knowledge
- Administer certifications and examinations
- Collect data and maintain records with respect to accidents, dangerous occurrences and inspections

Sector Overview and Administration

2016 Highlights

Natural Resources Canada indicates the production value of B.C. mines increased in 2016 to \$6.7 billion (from \$6.2 billion in 2015). Estimates generated by the [British Columbia Mineral and Coal Exploration Survey](#) showed that exploration expenditures in B.C. were \$205 million for 2016, down from \$272 million for 2015. Over 30,000 people in British Columbia were employed in mineral exploration, mining and related sectors in 2016.



Metal and Coal Mine Activities

Eight metal mines and seven coal mines (including Huckleberry and Quinsam, which went into care and maintenance) were in production across B.C. in 2016. The following tables provide information on these mines, including estimated production based on company reports.

Metal Mines

Mine Name	Company	Nearby Community	Production	
Copper Mountain	Copper Mountain Mining	Princeton	Copper	82.9 million lbs
			Gold	30,800 oz
			Silver	291,900 oz
Gibraltar	Taseko	Williams Lake	Copper	133.2 million lbs
			Molybdenum	949,000 lbs
Highland Valley Copper	Teck	Logan Lake	Copper	263 million lbs
			Molybdenum	5.4 million lbs
Huckleberry ¹	Imperial Metals	Houston	Copper	20.4 million lbs
			Gold	1,927 oz
			Silver	100,425 oz
Mount Milligan	Thompson Creek Metals	Fort St. James	Copper	58.5 million lbs
			Gold	204,542 oz
Mount Polley	Imperial Metals	Likely	Copper	25.3 million lbs
			Gold	46,444 oz
			Silver	90,125 oz
New Afton	New Gold	Kamloops	Copper	87.3 million lbs
			Gold	98,098 oz
			Silver	300,000 oz
Red Chris	Imperial Metals	Iskut	Copper	83.6 million lbs

Coal Mines

Mine Name	Company	Nearby Community	Production (tonnes)
Brule ²	Conuma Coal	Chetwynd	350,789
Coal Mountain	Teck	Sparwood	2.6 million
Elkview	Teck	Sparwood	7.2 million
Fording River	Teck	Elkford	7.4 million
Greenhills	Teck	Elkford	5.8 million
Line Creek	Teck	Sparwood	4.0 million
Quinsam ³	Quinsam Coal Corp.	Campbell River	N/A

¹ Placed in care and maintenance in August 2016

² Restarted operations in September 2016

³ Placed in care and maintenance in January 2016

Mine Visits and Inspections

Mine visits include site visits done by EMPR staff and contractors for the purpose of conducting inspections as well as audits, meetings, investigations or training. In 2016, inspectors of mines made 1,944 visits to mine sites across B.C. and conducted 1,345 inspections.

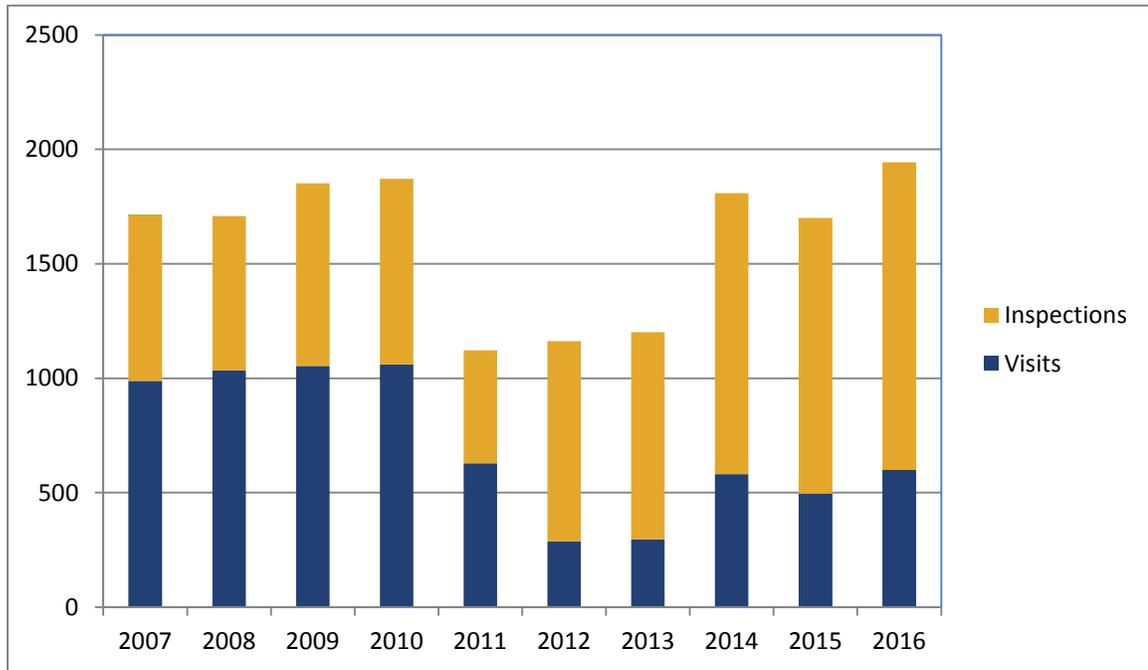


Figure 1: Number of Mine Visits and Inspections, 2007–2016

Orders

During their reviews, inspectors of mines may decide to issue orders for contraventions of the *Mines Act*, the Code, other applicable codes and statutes (e.g., the Canadian Electrical Code) or permit conditions. Orders can generally be grouped into the categories of health and safety, environmental, and shutdown (which includes orders to shut down all or part of a mine site).

The table below summarizes orders issued in 2016.

Type of Order	2016
Health and Safety	3,046
Environmental	406
Shutdown	51
Total Orders Issued	3,503

Code Review

In July 2015, a committee was appointed to [review the Health, Safety and Reclamation Code for Mines in British Columbia](#) to determine how best to implement the 26 recommendations made in the reports of an independent expert engineering panel and the chief inspector of mines following their investigations into the 2014 tailings breach at the Mount Polley mine. The code review committee was chaired by the chief inspector of mines and included an equal number of representatives from mine labour unions, industry, and, for the first time, First Nations.

The committee's review of the tailings storage facilities portion of the Code was completed in 2016 and updates came into force July 20 of that year. These updates include enhanced validation of safety and regulation of all phases of a tailings storage facility: all mines in B.C. with a tailings storage facility must now have an independent tailings review board.

The health and safety portion of the Code review continued through until the end of 2016, with revisions coming into force in February 2017.

The regulatory changes made to the tailings portion of the Code can give British Columbians confidence that provincial standards for tailings storage facilities are as good as or better than anywhere else in the world.



Health and Safety

Occupational Health

The Occupational Health (OH) Department's staff members assist in the anticipation, recognition, evaluation and control of health hazards for mines in British Columbia. They provide materials for health and safety education and training, and set standards for the inspection and enforcement of occupational health issues.

The Code requires mine managers to develop and implement a written occupational hygiene-monitoring program to establish procedures and measure chemical and physical hazards to which workers are exposed in the workplace. These hazards can include dusts, silica, respirable combustible dust, noise, gases and fumes, radiation and heat/cold stress. The OH Department makes comparative measurements to ensure companies follow proper procedures and obtain accurate results.

A written preventative training program that educates a mine site's workforce and occupational health and safety committee members on the recognition, evaluation and prevention of adverse health effects resulting in musculoskeletal disorders is also a requirement of the Code. These disorders may consist of lower back injury, repetitive strain, overexertion or vibration-induced injuries. Training must include a component that involves identifying and evaluating risks to develop practical solutions. The OH Section assists mines in this training area by providing information and assistance as needed.

Medical surveillance and Workplace Hazardous Materials Information System (WHMIS) programs are included in the OH Department's responsibilities. OH staff also provide assistance in program development.

2016 Highlights

Conducted onsite inspections to monitor workplace conditions.

Conducted two major compliance audits focused on Part 2 of the Code at Huckleberry Mine and Highland Valley Copper Mine.

Participated in mine development review committees to address and encourage anticipation, elimination and control of occupational health concerns in the early phases of project development and design.

Conducted five musculoskeletal disorder prevention workshops.

Greater Protection for Worker Health

The OH Section led the development of recommendations for updated regulations to Part 2 of the Code in 2016. This involved research, conducting workplace monitoring, whole body vibration sampling, and participating in Code review discussions.

Maximum allowable exposure limits were reduced for silica, nitrogen dioxide, lead and carbon disulphide. The exposure limit for welding fumes was rescinded from Table 2-1 of the Code with the intent of ensuring exposures to individual welding fume constituents are evaluated to more accurately determine worker exposures. A notations column was added to highlight substances that are considered to be carcinogens, sensitizers and reproductive toxins. The notations column now identifies substances that may significantly contribute to overall exposure by the skin route.

Competitions and Awards

Many B.C. mining companies and their individual workers not only meet the applicable requirements of the *Mines Act* and the Code but also voluntarily and consistently exceed them. Through their efforts and those of provincial government staff, mining is one of B.C.'s safest heavy industries.

Mine rescue competitions, first aid competitions and safety awards all promote and encourage safety at B.C. mines. [Reclamation awards](#) acknowledge companies that go beyond their mine plans by conducting superior research and introducing innovative techniques to restore the land.

Mine Rescue Competitions

Kimberly hosted the 61st annual Provincial Mine Rescue and First Aid Competition on June 4, 2016. EMPR staff and industry personnel judged the competitions. Congratulations to all the winners.

Award	Winner
Levitt Safety Fire Trophy for an underground mine rescue team	New Afton
Levitt Safety Fire Trophy (Surface)	Greenhills
Highest Non-Aggregate Points Trophy	Greenhills
Richard Booth Award (Best Written for Underground Team)	New Afton
EKMISA Trophy (Best Written for Surface Team)	Elkview
Underground Mine Rescue Overall Winner	New Afton
Surface Mine Rescue Overall Winner	Greenhills
Barry Abbott Memorial Trophy – Underground Bench Competition	Sullivan
Maurice Boisse Memorial Trophy – Surface Bench Competition	Elkview
Keith Bracewell Memorial Award – Obstacle and Recovery	New Afton

First Aid Competitions

There were two competitions in the first aid category in 2016. Greenhills Mine won the three-person miners' first aid competition; Greenhills also took home the 2016 Kathy Lofstrom Memorial Trophy for best coach of a first aid team (Amanda Cunliffe). The first aid component of the underground mine rescue competition, also known as the Sullivan Cup, went to New Afton.

55th Annual Mine Safety Awards

The 55th Annual Mine Safety Awards for 2016 were handed out in Victoria on February 27, 2017 to B.C. mines and quarries that accumulated 15,000 or more worker or contractor hours and had no fatalities between the period of January 1 and December 31, 2016. Congratulations to the winners.

Award	Winner(s)
Small Underground Mine Safety Award	Silvertip
Large Underground Mine Safety Award	New Afton
John Ash Award – Open-Pit Mines and Quarries	Gibraltar Greenhills
Edward Prior Award – Open-Pit Mines and Quarries	Copper Mountain
Stewart/O’Brian Safety Award – Open-Pit Mines and Quarries	Cox Station Central Aggregates Pitt River Quarries Ward Pit Earle Creek Orca Sand and Gravel Sumas Shale Quarry

Certificates of Achievement and Special Commendations and Awards

Certificates of achievement are presented to mines with a minimum of 15,000 worker hours and an injury-frequency ratio of zero. Nine operations qualified in 2016: Harper Ranch Quarry; Windermere; Treat Creek; Jamieson Quarry and Maple Ridge Sand and Gravel; Imperial Limestone Co. Ltd.; Northwest Bay Quarry; Mission Pit; Trend-Roman Mine; and Abbotsford Gravel.

National Safety Awards – John T. Ryan Trophies

John T. Ryan trophies are provided by Mine Safety Appliances Canada Limited as a memorial to its founder. The Canadian Institute of Mining, Metallurgy and Petroleum presents the awards to the metal mine, coal mine and select mine that, in the previous year, experienced the lowest reportable injury frequency per 200,000 employee hours in all of Canada. There are two trophy categories: Canada and Regional. Teck’s Greenhills Operations was awarded the Canadian national award for the lowest reportable injury frequency in the coal mine category during the 2016 calendar year for the fourth year in a row.

Certifications

The *Mines Act* states that every person employed at a mine must, if required by the regulations or the Code, be under the daily supervision of a person who holds a valid and appropriate certificate as required by the regulations or the Code. The required certification is specified in Part 1.12 of the Code. Recipients of a valid permanent certificate must complete re-examination every five years to ensure that their knowledge of the Code remains current.

Shiftboss Certificates

When six or more people are working in an open-pit or underground mine, they must be under the supervision of a person holding a shiftboss certification. The following table summarizes shiftboss certification activity in 2016:

Shiftboss Certification Type	New Certificates
Surface (includes sand and gravel)	79
Underground	45
Total Permanent Certificates Issued	124

Three shiftboss certifications were suspended in 2016.

Underground Coal Fireboss Certifications

Fireboss certification is required to supervise people in underground coal mines. Six underground coal fireboss certificates were issued in 2016, and none were suspended.

Blasting Certificates

Blasting certification is required to perform blasting on a mine site in B.C. Types of blasting certificates include basic, exploration, surface, underground, underground coal (shotfirer), electrical blasting, and general, which includes all categories except underground coal.

In 2016, 104 new blasting certificates were issued, 70 certificates were recertified, and three blasting certificates were suspended.

Mine Rescue Certifications

To qualify for mine rescue certification, mine employees must complete approved training and demonstrate their knowledge in rescue techniques by passing an exam that consists of both a written and practical skills component.

The provincial government is responsible for certifying miners in several categories of mine rescue. The following mine rescue certificates were issued in 2016:

Type	Number Issued
Underground mine rescue	144
Surface (open-pit) mine rescue	182
Total certificates issued	326

Accidents and Incidents

Injury Rates for Quarries and Open-Pit Coal, Open-Pit Metal and Underground Mines

Mining is one of British Columbia's safest heavy industries, and the Province remains committed to ensuring that B.C. remains a world leader in mine health and safety practices. According to WorkSafeBC data, the 2016 total estimated injury

rate at mines in British Columbia was 0.9. While this is a small increase over 2015 (0.7), the mining industry has a very low rate of work-related injury claims when compared to other heavy industries.

The table below outlines the injury rates for the mining industry over the past 10 years; the unit for injury rates is the number of claims per 100 person-years of employment. Rates may be adjusted on an ongoing basis to match claims data.

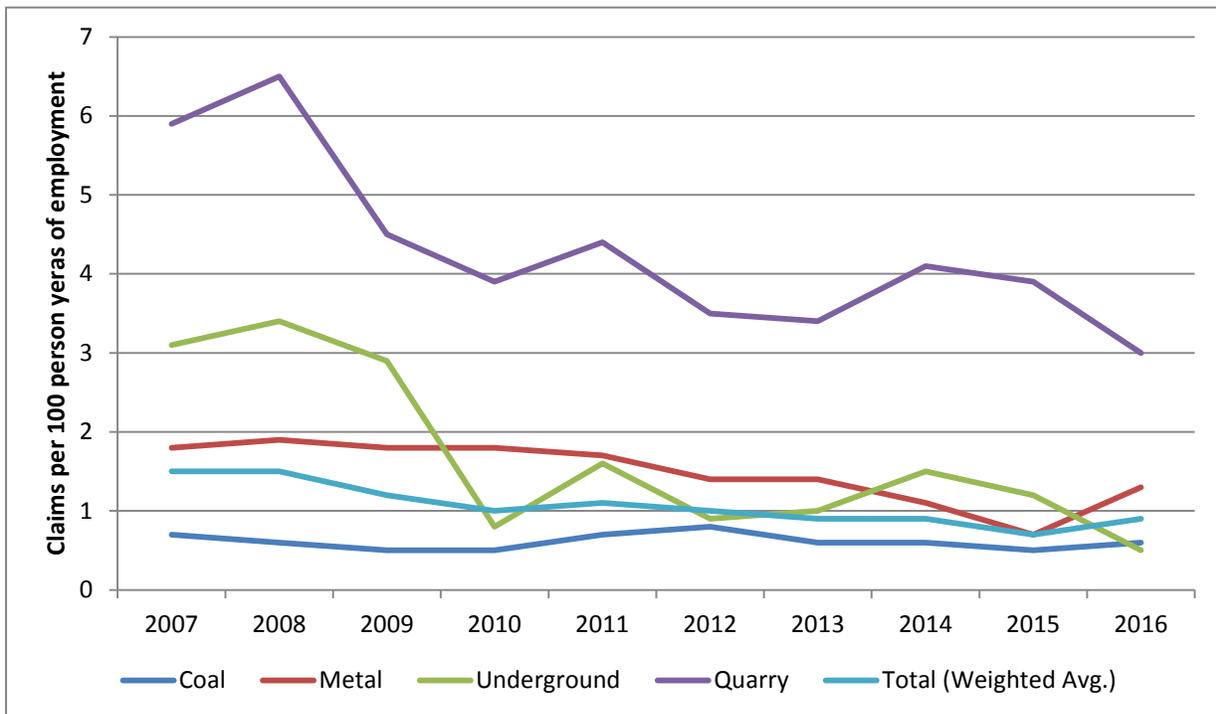


Figure 2: Injury Rates for Quarries, Open-Pit Coal, Open-Pit Metal, and Underground Mines in British Columbia, 2007–2016

Fatalities

There were no mining-related fatalities in 2016.

Investigations

In 2016, three investigations were either initiated or ongoing:

- The Swansea Ballast Quarry double fatality investigation initiated in 2014 continued through 2016.
- A Polar Jade Mine fatality investigation was initiated in July 2015 and continued through 2016.
- A Banks Island Gold permit non-compliance investigation was initiated in July 2015 and continued through 2016.

Mechanical and Electrical Engineering

Health, Safety and Permitting Branch mechanical and electrical inspectors are located throughout the province. They ensure that all mechanical and electrical equipment installed and used at mines in B.C. complies with the *Mines Act* as well as all applicable codes and standards, and that this equipment is maintained and operated appropriately to reduce risks to people and property.

2016 Highlights

- Participated on mine development review committees to review and comment on the design and construction plans of new mines.
- Took part in the annual [Provincial Mine Rescue and First Aid Competition](#).
- Conducted numerous mine site inspections and attended meetings across the province.
- Participated in the Code review.
- Continued to participate on several Canadian Standards Association (CSA) and International Organization for Standardization review committees and the CSA Mine Advisory Panel.



Permitting

Mining activities require a *Mines Act* permit before work can proceed. There are two application permitting processes that can be used, which are dependent on the mine type and scope of activities proposed.

EMPR's regional offices handle applications under section 10.1.1 of the Code for all exploration, placer, quarry and sand and gravel mining activities. Applications are submitted through a Notice of Work (NOW) and are reviewed by EMPR regional staff, First Nations, other agencies, and specialist technical staff as required.

For larger metal and coal mines that fall under section 10.1.2 of the Code, applications are submitted to the chief inspector of mines for review. This includes applications for new mines as well as applications for major expansions/upgrades to existing mines, amendments for changes to existing mines, and some large-scale exploration/development projects.

The review of major mine projects is supported by an interagency review that is coordinated by either a Mine Development Review Committee (MDRC) that is organized by regional offices, or through a Mine Review Committee (MRC) that is coordinated by the Major Mine Permitting Office (MMPO), a separate branch within EMPR. Where multiple authorizations are required, the MMPO typically coordinates the review of all applications, providing a one-window approach for proponents. The MMPO-led process supports a thorough, timely and integrated assessment of a project, and provides meaningful opportunities for participation by First Nations, proponents, local governments, and federal and provincial agencies.

New major mines and expansions may also be subject to the [Environmental Assessment Act](#) and require an Environmental Assessment Certificate. The environmental assessment (EA) process is managed by the [Environmental Assessment Office](#). For larger projects and major expansions, the EA process typically precedes the *Mine Act* permit application review, with an EA certificate required prior to the issuance of any other permits or authorizations. MMPO works with the Environmental Assessment Office to create regulatory continuity from EA through to the subsequent permitting process, so that pertinent issues are tracked and addressed where needed.

Co-operation and Consultation with First Nations

Before issuing authorizations for any mining activity, the Province has a constitutional obligation to consult and, where appropriate, accommodate First Nations on land and resource decisions that could potentially impact their Indigenous rights, title, and interests. EMPR works closely with First Nations throughout the full life cycle of a mine to ensure Indigenous peoples' input is considered in the Province's decision-making processes. Through the Economic and Community Development Agreement program, the Province also shares mineral tax revenues with impacted First Nations on new and expanding major mines to support their socio-economic priorities.

While the Province is responsible for ensuring adequate and appropriate consultation and accommodation, it also encourages mining proponents to engage early with First Nations in the project planning stages and to build ongoing, strong relationships throughout the life of mining projects.

2016 Highlights

During 2016, a total of 42 *Mines Act* permit amendments were issued for major mines across B.C. This included major expansions at Elkview Operations (Baldy Ridge Extension), Greenhills Operations (Cougar Pit Extension) and re-design at Fording River Operations (North Spoil Rehandle). The Ministry also approved a return to full mine operations at the Mount Polley mine and the south tailings dam at the Red Chris Mine. Other permit amendments were issued for Bralorne, Brucejack, Coal Mountain, Craigmont, Elkview, Equity Silver, Highland Valley Copper, Mount Polley, Myra Falls, Silvertip, Sullivan and Texada, among other operations, for various projects and plans.

EMPR technical staff were involved in the EA reviews of several mine project applications in 2016, including the Ajax, Blackwater, Burnco, Elkview Baldy Ridge Extension, Giscome, Kemess Underground, Kootenay West, and Sukunka projects. EMPR staff also participated in technical working groups for the Bingay, Crown Mountain, Michel Creek, and Red Mountain projects.

MMPO provided mine review process or support for the following projects: Ajax; Blackwater; Brucejack; Burnco; Conuma Mines; Dome Mountain; Giscome; Gibraltar; Kemess Underground; Kootenay West; Murray River; Red Chris; Red Mountain; Ruddock Creek; Silvertip; and Sukunka.



Geotechnical

The Geotechnical Department enforces provisions of the *Mines Act* and the Code and is responsible for performing compliance reviews and completing inspections at operating and closed mines with a focus on performance of tailings dams, waste rock dumps, open-pit slopes and underground openings. Mining projects are reviewed for the health and safety of the public and mine workers, as well as protection of the environment.

Geotechnical Department staff provide technical reviews of proposed mining projects seeking approval under the *Mines Act* and the B.C. *Environmental Assessment Act*. The department also reviews geotechnical incidents and responds to mine inquiries.

The Geotechnical Department provides geotechnical advice and leads or assists policy development for:

- tailings impoundments and dams
- waste rock and overburden dumps
- open pits and underground developments
- mine roads
- risk evaluation for worker protection and public health and safety
- assessing the environmental impact of geotechnical projects

2016 Highlights

In 2016, the Geotechnical Department (four EMPR staff, three contractors and a consulting firm):

- Conducted 59 geotechnical inspections (compared to 41 in 2015) at metal and coal mines as well as at several placer operations and select sand and gravel quarries.
- Developed geotechnical permit conditions for the construction and operation of major mine structures, including tailings impoundments, pit walls, and waste rock dumps.
- Undertook environmental assessment reviews for new mine projects.
- Reviewed annual reports for tailings storage facilities, waste rock dumps and pit walls.

Tailings Storage Facilities

On September 30 and December 31, 2016 new compliance requirements for tailings storage facilities (TSFs) as set out in the revised Code came into effect. The updated requirements for TSFs now make British Columbia one of the safest mining jurisdictions for tailings storage facilities in the world.

The major new requirements include:

- An engineer of record (EoR) to be retained and in place
- An independent tailings review board (ITRB) to be appointed

Additionally, a dam safety inspection (DSI) must be completed each year by the EoR. Generally, mines must submit reports outlining the results of their annual requirements to the chief inspector of mines by March 31 following the compliance year.

The design, construction and operation of tailings facilities and dams on mine sites in British Columbia are regulated by the *Mines Act* and the Code. The latter requires DSIs to be carried out annually for all dams on a mine site in accordance with [EMPR guidelines](#). Reports must be prepared by a qualified professional engineer registered with the Association of Professional Engineers and Geoscientists of British Columbia and submitted to EMPR by March 31 of the year following the inspection.

The objective of these annual inspections is to review the operation, maintenance and surveillance of tailings storage facilities. A DSI typically involves a review of existing documents, a site visit by a qualified professional engineer, interviews with the tailings storage facility inspector and operators, a visual inspection of the facility, and a review of available instrumentation and monitoring data. The DSI report provides recommendations ranging from items impacting the safety of the dam to best management practices. DSI reports also provide schedules and priority levels for executing the listed recommendations to ensure dams are operated or maintained in safe and stable conditions. Typical recommendations include adjusting the current operations, updating the operation manual and emergency plan documents, provision of additional inspection and instrumentation, carrying out repair and maintenance activities, or conducting new analyses.

DSI reports for mines in British Columbia are available [online](#).



Photo credit: Red Chris Mine

Reclamation

The Reclamation Department enforces provisions of the *Mines Act* and the Code through permit conditions, inspections and detailed technical reviews aimed at finding environmentally sound, economically viable solutions that enable British Columbia's mining industry to remain internationally competitive without compromising the Province's rigorous environmental standards. Staff members have expertise in the technical areas of soil restoration, re-vegetation, land capability, erosion control, geology, geochemistry and metal leaching and acid rock drainage (ML/ARD).

Environmental Protection and Reclamation Objectives

The *Mines Act* and the Code ensure:

- Land and watercourses on mine sites in B.C. are reclaimed to a level equal to that which existed prior to mining.
- Disturbed lands and watercourses are re-integrated into the surrounding landscape.
- Long-term stability of structures (e.g., tailings storage facilities).
- Mining and mitigation requirements associated with ML/ARD are conducted in a manner that prevents significant impacts to downstream or onsite biota to minimize reduction in post-mining productive capacity of the site.

To achieve these objectives, the Reclamation Section:

- Conducts detailed technical reviews of new projects and proposed project revisions under the *Environmental Assessment Act*.
- Conducts detailed technical reviews and issues permits for operating and closed mines with outstanding reclamation responsibilities.
- Inspects mine reclamation activity.
- Administers reclamation security deposits on behalf of the Province.
- Participates in national and international committees conducting research and technology transfer.
- Organizes and participates in various provincial committees and activities that review and highlight best practices and facilitate government co-operation with industrial, public and academic institutions.

2016

Highlights

- Developed a provincial ML/ARD policy, a more detailed set of ML/ARD guidelines, and a manual of recommended methods for the prediction of ML/ARD to provide a checklist for industry and inform the public of regulatory conditions and environmental protection requirements.
- Commissioned an in-depth examination of [reclamation securities practice](#).
- Participated in the [Technical and Research Committee on Reclamation](#).
- Represented the provincial government on the [National Orphaned/Abandoned Mines Advisory Committee](#).
- Contributed to the Annual Mine Reclamation Symposium that was attended by over 140 delegates.

- Helped organize a ML/ARD workshop with the theme: Challenges and Best Practices in Metal Leaching and Acid Rock Drainage.
- Participated on the British Columbia Mines Reclamation Awards selection committee. (The recipient of the 2016 Jake McDonald Mine Reclamation Award for outstanding reclamation was Mount Milligan Mine.)

Reclamation Securities and Funds

Prior to starting work, mining companies operating in B.C. are required to obtain a permit approving the mine plan, a program for protection of the land and watercourses, and a reclamation program. Mining companies must also place a security deposit with the Province to ensure reclamation obligations are kept. These security deposits ensure that reclamation costs do not fall on taxpayers (e.g., if a mining company goes bankrupt).

In the past few years, the value of security deposits has increased to reflect more closely the full costs of reclamation. The total value of securities held by the Province has risen from \$10 million in 1984 to slightly more than \$1.191 billion by the end of 2016.

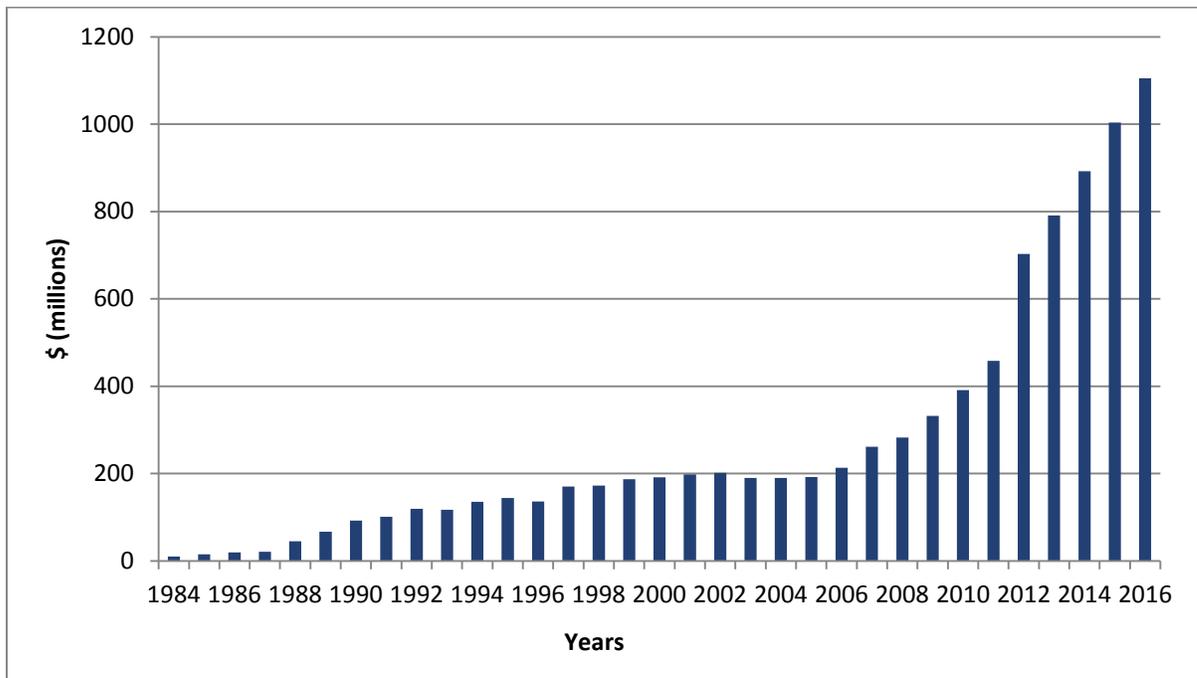


Figure 3: Reclamation Security Deposits Held by the Province (Initiation to 2016)

A summary of the reclamation liability for major mines and current reclamation security held by EMPR is presented in the following table, which includes information up to December 31, 2016. Additionally, mine permits may contain schedules for placing additional security that are not reflected in this table. An additional \$900 million in additional bonding is scheduled to be deposited as part of permitting conditions within the next six years (by 2024).

Mine	Owner (2016)	Total Bond Amount (\$)	Liability Estimate (\$)	Differential (\$)
Coal Mine Permits				
Elk Valley (Elkview, Fording River, Line Creek, Coal Mountain, Greenhills)	Teck Coal Limited	517,470,000.00	1,404,810,000.00	887,340,000.00
Sage Creek	Sage Creek Coal Ltd.	1,000.00	1,000.00	0.00
Tent Mountain	Luscar	58,500.00	58,500.00	0.00
Sukunka	Tailsman Energy Inc.	50,000.00	67,500.00	17,500.00
Mt Speiker	Canadian Natural Resources Ltd.	10,000.00	10,000.00	0.00
Benson Mt.	Netherlands Pacific Mining Co. Ltd.	5,000.00	5,000.00	0.00
Willow Creek	Walter Energy/Willow Creek Coal partnership	6,000,000.00	11,987,574.00	5,987,574.00
Quintette	Teck Coal Limited	20,083,200.00	27,020,000.00	6,936,800.00
Bullmoose	Teck Coal Limited	1,000,000.00	1,000,000.00	0.00
Benson Mt.	Wolf Mountain Coal Ltd.	20,000.00	20,000.00	0.00
Arctos Anthracite	Fortune Coal Ltd.	25,000.00	0.00	0.00
Quinsam	Quinsam Coal Corp.	7,281,000.00	7,281,000.00	0.00
Basin Coal	Basin Mine Ltd. Partnership	276,547.00	316,500.00	39,953.00
Brule	Walter Energy /Brule Coal Partnership	3,350,000.00	23,833,875.00	20,483,875.00
Wolverine	Walter Energy /Wolverine Coal partnership	11,500,000.00	47,194,812.00	35,694,812.00
Trend-Roman	Peace River Coal Ltd.	53,900,000.00	93,330,564.00	39,430,564.00
Metal Mine Permits				
Endako	Thompson Creek Mining Co.	15,345,700.00	45,837,084.00	30,491,384.00
Pinchi	Teck Resources Ltd.	2,000,000.00	2,000,000.00	0.00
Granisle	Glencore Canada Corp.	161,522.00	678,935.00	515,413.00
Island Copper	BHPBilliton Base Metals.	4,214,508.00	4,637,000.00	422,491.00
Kitsault	Avanti Kitsault Mine Ltd.	1,770,000.00	1,770,000.00	0.00
Highland Valley Copper	Teck Highland Valley Copper Ltd.	18,250,000.00	215,691,231.00	197,441,231.00
Brenda	Glencore Canada Corp.	5,000,000.00	39,800,000.00	34,800,000.00
Cassiar	Cassiar-Jade Contracting Inc.	600,000.00	530,000.00	0.00
Myra Falls	NVI Mining Ltd.	70,826,762.00	99,149,560.00	28,322,798.00
Copper Mountain	Copper Mountain Mining Corp.	11,500,500.00	6,950,000.00	8,799,500.00
Bull River	Bull River Minerals Corp.	491,511.19	470,747.00	0.00
Bell	Glencore Canada Corp.	15,000,000.00	13,879,331.00	0.00
Taseko Mines Ltd.	Gibraltar Mines Ltd.	47,430,418.00	33,430,000.00	0.00

Mine	Owner (2016)	Total Bond Amount (\$)	Liability Estimate (\$)	Differential (\$)
Alwin	Dekalb	6,000.00	8,063.00	2,063.00
Giant Nickel	Barrick Gold Inc.	27,000.00	12,524,463.00	12,497,463.00
Silvana/ Hinckley	Klondike Silver Corp.	75,000.00	185,333.00	110,333.00
Craigmont	Huldra Properties Inc.	700,000.00	1,447,005.00	747,005.00
Dolly Varden	Dolly Varden Mines Ltd.	6,000.00	6,000.00	0.00
Beaverdell	Teck Resources Ltd.	5,000.00	10,000.00	5,000.00
Mt. Copeland	KRC Operators	3,484.10	3,484.10	0.00
Sullivan	Teck Resources Ltd.	22,500,000.00	22,500,000.00	0.00
HB Mine	Teck Resources Ltd.	10,000.00	10,000.00	0.00
Dankoe	439813 BC Ltd.	10,000.00	0.00	0.00
Boss Mountain	Glencore Canada Corp.	30,000.00	1,217,367.00	1,187,367.00
Afton	KGHM Ajax Mining Inc.	350,000.00	2,000,000.00	1,650,000.00
Equity	GoldCorp	82,467,000.00	82,467,000.00	0.00
Cusac	Cassiar Gold Corp.	264,444.00	1,613,758.00	1,349,314.00
Mosquito Creek	Mosquito Consolidated Gold Mines Ltd.	5,000.00	437,119.00	432,119.00
Carolin	New Carolin Gold Corp.	256,250.00	107,733.88	0.00
Scottie Gold	Red Eye Resources Ltd.	15,000.00	15,000.00	0.00
Baker	Dupont Canada Ltd.	15,606.00	165,681.00	150,075.00
Goldstream	Bethlehem Resources (1996) Corp.	200,000.00	1,074,418.00	874,418.00
Venus	United Keno Hills Mines Ltd.	7,000.00	7,000.00	0.00
Taurus	Cassiar Gold Corp.	10,000.00	10,000.00	0.00
Dimac	Dimac Resources Corp.	10,000.00	10,000.00	0.00
Baymag	Baymag Mines Co. Ltd.	15,101.71	818,529.00	803,427.00
Ashlu Gold	Osprey Mining and Exploration Ltd.	10,000.00	160,000.00	150,000.00
Four-J /Lussier	Georgia Pacific Canada Ltd.	20,000.00	578,498.00	558,498.00
Perlite	Aurum Mines Ltd.	0.00	0.00	0.00
Union	Sumac Resources Ltd.	5,000.00	1,100.00	0.00
Blackdome	J- Pacific Gold Inc	100,000.00	130,000.00	30,000.00
Nickel Plate	Barrick Gold Inc.	1,671,754.00	159,912,573.00	158,240,819.00
Cheni/ Lawyers	Cheni Gold Mines Ltd	1,766.00	14,400.00	12,634.00
Johnny Mountain	Skyline Gold Corp.	562,310.33	336,000.00	0.00
Premier	Boliden Westmin Canada Ltd.	3,000,000.00	3,000,000.00	0.00
Parson Barite	Sherritt International Corp.	10,000.00	83,680.00	73,680.00
Candorado	Candorado Mines	0.00	3,000,000.00	3,000,000.00

Mine	Owner (2016)	Total Bond Amount (\$)	Liability Estimate (\$)	Differential (\$)
Samatosum	First Quantum Minerals Ltd.	7,800,000.00	7,266,667.00	0.00
Barrier Feldspar	Kanspar Industries Inc.	20,000.00	0.00	0.00
Golden Bear	Goldcorp Canada Ltd. - Equity Division	210,000.00	73,200.00	0.00
Horse Creek Silica	HiTest Sand Inc.	125,000.00	94,873.00	0.00
Sable/Shasta	Sable Resources Ltd.	72,753.76	1,110,000.00	1,037,246.24
Snip	Barrick Gold Inc.	1,000,000.00	2,870,000.00	1,370,000.00
CIL	Clayburn Industries	1,000.00	5,000.00	4,000.00
Cirque	Cirque Operating Corp.	220,000.00	220,000.00	0.00
Eskay Creek	Barrick Gold Inc.	3,774,000.00	7,694,760.00	3,920,760.00
QR	Barkerville Gold Mines Ltd.	8,750,000.00	10,250,000.00	1,500,000.00
Elk/Siwash	Gold Mountain Mining Corp.	150,000.00	60,672.00	0.00
Mount Polley	Mount Polley Mining Corp.	28,740,611.00	31,350,611.00	2,610,000.00
Huckleberry	Huckleberry Mines Ltd.	32,000,000.00	66,600,000.00	34,600,000.00
Kemess South	AuRico Gold Inc.	18,520,000.00	17,144,663.00	0.00
Bralorne	Bralorne Gold Mines Ltd.	615,000.00	12,300,000.00	11,685,000.00
Bow Mines (Tailings)	Golden Dawn Minerals Inc.	50,000.00	52,210.00	2,210.00
Ainsworth Mill	Bluebird Mining Ltd.	5,000.00	250,000.00	245,000.00
Quinto Mine	Saddle Mountain Minerals Ltd.	5,000.00	5,000.00	0.00
Blue Bell	Teck Resources Ltd.	0.00	0.00	0.00
HB Tailings	Regional District East Kootenay	0.00	0.00	0.00
Churchill Copper	Teck Resources Ltd.	0.00	0.00	0.00
Max Molybdenum	Discovery Ventures Inc.	730,000.00	1,313,403.00	583,403.00
New Afton	New Gold Inc.	9,500,000.00	9,954,858.00	454,858.00
Galore Creek	Galore Creek Mining Corporation	1,167,000.00	1,167,000.00	0.00
Ruby Creek	Global Drilling Solutions Inc.	100,000.00	50,000.00	0.00
Tulsequah	Chieftain Metals Inc.	1,183,708.31	1,200,000.00	0.00
Zip Mill	Huakan International Mining Inc.	235,000.00	202,225.00	0.00
Lexington-Grenoble	Huakan International Mining Inc.	215,000.00	168,232.00	0.00
Yellowjacket	African Queen Mines Ltd.	150,000.00	105,300.00	0.00
Mount Milligan	Terrane Metals Corp.	30,000,000.00	36,780,512.00	6,780,512.00
Dome Mountain	Gavin Minerals Ltd.	579,000.00	13,312,503.00	12,733,503.00
Bonanza Ledge	Barkerville Gold Mines Ltd.	3,160,000.00	6,356,780.00	3,196,780.00

Mine	Owner (2016)	Total Bond Amount (\$)	Liability Estimate (\$)	Differential (\$)
Treasure Mountain	Huldra Silver Inc.	505,100.00	505,100.00	0.00
Red Chris	Red Chris Operating Corp.	12,000,000.00	17,614,271.00	5,614,271.00
Yellow Giant (Tel)	Banks Island Gold Ltd.	213,367.17	2,273,123.00	2,059,755.83
Silvertip	JDS Silver Inc.	6,500,000.00	18,179,000.00	11,679,000.00
Brucejack	Pretium Resources inc.	14,200,000.00	32,637,821.00	18,437,821.00
Total		1,105,486,406.50	2,674,643,534.68	1,588,331,041.82

Note: Bonds greater than liability have an undersecure of zero rather than a negative number.

Industry Reclamation Record

British Columbia's land base is roughly 95 million hectares and, while land occupied by the mining industry has steadily grown since the late 1960s, mining has touched less than one per cent of the province. Major coal and metal mines, which occupied less than 1,000 hectares in 1969, had, by the end of 2016, expanded to cover 52,665 hectares. Close to one-third of this disturbed land (15,300 hectares) has been reclaimed (i.e., re-vegetation has been successfully established for one year or more).

Metal mines have disturbed 28,470 hectares and 7,886 hectares (27 per cent) of this land has been reclaimed. Coal mines have disturbed 24,195 hectares and 7,414 hectares (30 per cent) have been reclaimed. The increase in disturbance and decrease in reclamation at mine sites in the last few years is the result of the current pace of construction and development of new mines and the expansion and redevelopment at older mines.





Ministry of
Energy, Mines and
Petroleum Resources

Office of the Chief Inspector of Mines
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