

# Tailings, Waste & Environmental Management



Due to the physical disturbance of the land, generation of air- and water-based emissions, use of resources, and associated production processes, mining has the potential to adversely impact the environment. Many of these impacts can be mitigated or avoided through proper management and recognition of the interrelated nature of environmental issues, the cumulative nature of many environmental impacts, and the need to look at impacts across the mining life cycle and value chain.

We work in highly regulated jurisdictions with stringent and rigorously applied environmental legislation, which also makes environmental and waste management a key compliance issue. There is potential through future innovation to substantially reduce tailings and waste rock beyond current technologies, but currently there are tens of thousands of mine waste facilities globally and, more specifically, thousands of tailings facilities.

In recent years, there have been serious tailings facility failures, including the tragic failure at Vale's Brumadinho facility in Brazil in January 2019. Responsible management of tailings and waste rock is essential for protecting both the environment and human health. Tailings storage facilities at all of our operating

and closed sites meet or exceed regulatory requirements, and we are continually improving the management of our facilities by developing and incorporating leading practices.

In 2018, Teck continued to play an active role in promoting best practices for tailings facility management, both in our own operations and across the mining industry. This included continued work with academic institutions such as the University of British Columbia, University of Alberta, University of Western Australia and Universidad de Chile to aid in providing programs with practical tools through industry-based education materials and in looking for innovative tailings and mine waste management solutions through industry-academia research and development.



## Our Performance in Tailings, Waste and Environmental Management in 2018

**Our Targets and Commitments:** We are committed to conducting regular audits of the environmental compliance of our sites. We develop corrective action plans based on findings, and we regularly assess the implementation of these plans. We have set a target to have zero significant environmental incidents each year. We continually review our facilities and procedures, and are committed to maintaining the highest standard of safety and environmental protection, including standards set by the Mining Association of Canada (MAC) and the International Council on Mining and Metals (ICMM).

### Tailings Management Performance

Teck manages 55 tailings facilities. Of these, 35 are at our operating mines, and 20 are at the legacy properties that we manage. This includes 15 dry stack facilities at our steelmaking coal mines. Of the 55 tailings facilities, 16 are in active use and 39 are closed and no longer receiving tailings. We had zero significant incidents at our tailings storage facilities in 2018, and all facilities performed as intended, with their inspections and assorted internal and external reviews conducted as scheduled. The main focus of our 2018 performance evaluation process was to improve management by ensuring that we had consistent and appropriate levels of internal and independent external review for our facilities commensurate with each facility's risk profile.

All of our operating and legacy facilities are reviewed against our internal policy and guidance documentation on a regular schedule, as described in Table 29. These reviews are designed to evaluate our conformance with international best practices, our internal policy/standards and applicable regulatory requirements.

Beyond the comprehensive external reviews, an additional level of facility oversight has been implemented by Teck for our tailings facilities. This oversight is provided by our Tailings Working Group, which includes subject matter experts from across our business units and sites. Tailings Governance Reviews are carried out by this group every second year at our operations and every third year at our legacy properties, as shown in Table 29. These reviews include confirmation that we have the personnel and procedures in place to meet our commitments and that we are addressing recommendations for continual improvement from our external reviews in a meaningful and timely manner.

We conducted Governance Reviews at our Elkview, Highland Valley Copper, Greenhills, Cardinal River, Sullivan, Quintette and Bullmoose sites and, in conjunction with Suncor, at Fort Hills to evaluate conformance with our internal tailings

"Managing mined tailings in a safe and environmentally responsible manner is an industry imperative. An increasing trend, and one that Teck has wholly embraced, is to tackle this issue as a global team effort. Teck regularly works with other mining companies, industry associations, regulators, industry experts, non-government organizations and leading academics. In my more than 30 years of work in the area of mine tailings, this collaborative trend is the most positive and encouraging development I have seen towards sustainable tailings management with zero catastrophic failures."



**Michael Davies**  
Senior Advisor,  
Tailings & Mine Waste  
Management

guidance documents and policy. We also have an ongoing process with the other shareholders of the Antamina mine that meets the requirements of our Governance Review process. We also introduced Governance Reviews to our major projects for the first time in 2018, which included our Quebrada Blanca Phase 2 project.

From the combined Governance Review process in 2018, there were no significant findings; however, several value-added items were identified and are being actioned by the sites. For more information on tailings management at Teck, [see our website](#).

**Table 29: Status of Major Tailings and Water Retaining Structures**

Location	Annual Dam Safety Inspections <sup>(1)</sup>	Dam Safety Reviews <sup>(2)</sup>	Independent Review Board Activity <sup>(3)</sup>	Governance Reviews
	Up to Date	Up to Date		
Carmen de Andacollo	✓	✓	✓	Third review scheduled for 2019
Elkview	✓	✓	✓	Initial review completed in 2018
Fording River	✓	✓	✓	Second review scheduled for 2019
Greenhills	✓	✓	✓	Second review completed in 2018
Highland Valley Copper	✓	✓	✓	Second review completed in 2018
Red Dog	✓	✓	✓	Second review scheduled for 2019
Sullivan <sup>(4)</sup>	✓	✓	✓	Second review completed in 2018
Louvicourt <sup>(4)</sup>	✓	✓	✓	Second review scheduled for 2020

(1) The Engineer of Record performs a detailed examination of the facility, its related infrastructure and the records relating to these, to identify any conditions or changes that might contribute to or signal the potential for a compromise to the safety and reliability of the structure.

(2) A facility review by an independent, third-party engineer not affiliated with the Engineer of Record or the Tailings Review Board. The frequency of these reviews depends on the failure consequence risk-rating of that structure.

(3) Review by a team of independent senior subject matter experts who review the facility design approach, surveillance results and a site's overall approach to tailings management, including performance of the Engineer of Record.

(4) Legacy property.

## Industry Association Activities

Teck chairs the MAC Tailings Working Group that has been responsible for providing industry-leading best practice guidance, including key industry guidance documents issued in 2017 and 2018. Teck was also an active participant on ICMM's Tailings Position Statement and Governance Framework, and is a participant on ICMM's leadership work on an aspirational goal of reducing reliance on conventional tailings practices.

Our internal guidelines are consistent with both ICMM and MAC principles and guidance. This guidance was updated in 2018 by our Tailings Working Group and will be the basis for our 2019 Governance Reviews. As a result of our ongoing Tailings Governance Review processes, and based on themes from the MAC and ICMM advancements, we are further strengthening our guidance related to change management, roles and responsibilities, enhancing integration of risk evaluation and identifying critical controls.

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## Sustainable Solutions in the Frozen Arctic

When Johanna Salatas arrived at Teck's Red Dog Operations, she discovered most of her colleagues were concerned about the limited and outdated options available to dispose of waste: burial in the landfill or incineration. Relying on the landfill wasn't a sustainable long-term option, and incinerating high volumes of trash contributed to greenhouse gas emissions.

In addition, there was the logistical challenge of developing a waste removal and recycling program for a remote site that does not have road access. Barge access was also limited to summer months when the Chukchi Sea thaws enough for shipping.

"Our goal was simple," says Johanna, acting Environmental Sustainability Coordinator. "We needed to reduce our reliance on incineration while also preserving valuable landfill space. Finding solutions to realize those goals was a much bigger hurdle, given our location 100 miles (161 kilometres) north of the Arctic Circle."

To get started, Johanna launched a Waste Characterization Study in 2017 to identify the types of waste streams as well as recycling and disposal options for large volumes of waste. This meant combing through the landfill to document and measure various types of garbage, carried out by a team of eight dedicated locally-hired people.

The study identified new opportunities for dealing with waste and in some cases, turning it into a source of revenue to help pay for a broader management plan that was developed with Waste Management International, a company that provides industries with recycling solutions.

This effort is currently projected to contribute over \$500,000 in revenue from what were previously waste materials.

In fall 2018, dedicated shipping container bins were placed around the site to collect a variety of scrap metals, including iron, tin, aluminum, stainless steel, magnesium, scandium and tungsten carbide, which will be shipped off-site and sold for reuse. Next, three full-sized cardboard balers were delivered; the baled cardboard will also be sold for profit. Finally, recycling bins were set up around the site to collect plastic bottles, aluminum cans and plastic shrink wrap. All the waste will be stored and shipped south when the sea thaws and the port opens.

In 2019, a dedicated Red Dog Recycling Centre will open to streamline these recycling efforts; the human power needed to run the program could potentially create new jobs in the region. Johanna is optimistic that the recycling revenue will be used for additional sustainability initiatives at Red Dog Operations.

"We've proven that the logistical challenges that come with Red Dog's remote location can still be solved with sustainable and profitable solutions," says Johanna.

## Waste Management Performance

In 2018, our operations generated approximately six million tonnes of mineral waste, with the vast majority being waste rock from the extraction of ore and steelmaking coal.

Teck's methods for recycling include recycling for value recovery, industrial waste processing and domestic recycling. We do not currently track office and construction waste, which are managed by licensed external waste service providers.

Figure 24: Mineral Waste

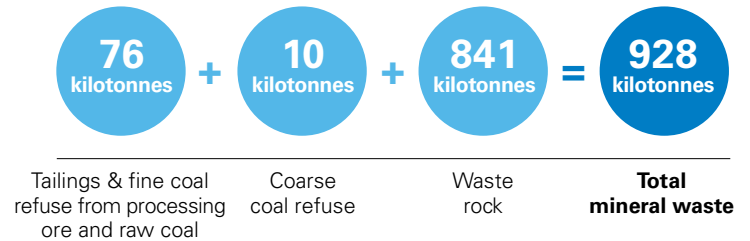
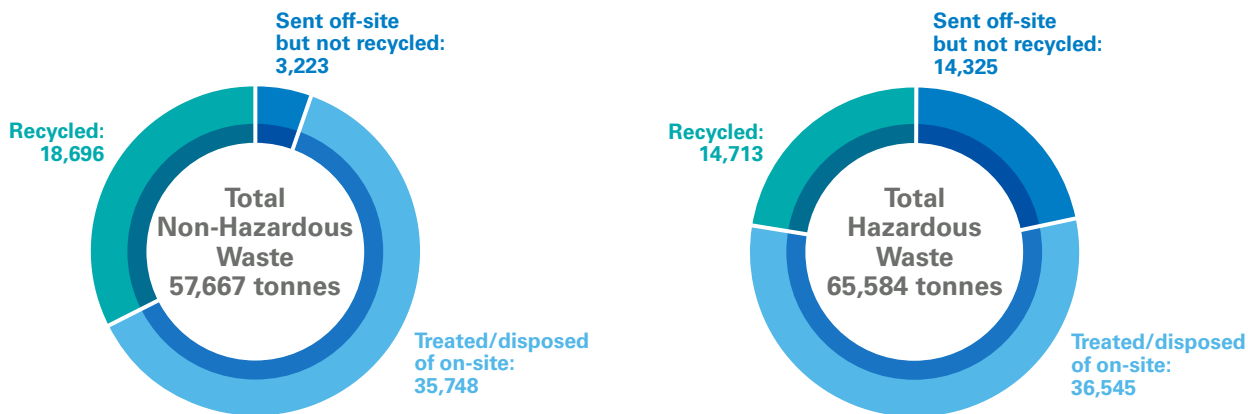


Figure 25: Hazardous and Non-Hazardous Waste (tonnes)<sup>(1)</sup>



(1) Recycled waste includes waste that is diverted from the landfill through recycling and reuse. Waste sent off-site but not recycled includes waste disposed of at appropriate facilities, landfills and deep-well injections.

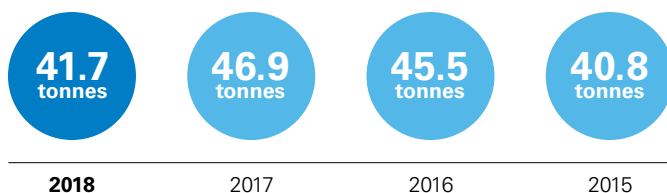
### Recycling

We recycle in accordance with international, national, provincial and local requirements, and we aim to exceed these requirements. Continually improving recycling at our operations by identifying and sharing best practices throughout the company is our goal — including ongoing assessments of our recycling and reuse practices.

At our Trail Operations, we recycle materials purchased from external users. Our focus remains on treating cathode ray tube glass, plus small quantities of zinc alkaline batteries and other post-consumer waste, through our lead acid battery recycling program.

Figure 26: Recycled Material at Trail Operations

Amount of recycled material



### Regulation, Permitting and Approvals

In August 2018, we received regulatory approval for our Quebrada Blanca Phase 2 (QB2) project in the Tarapacá Region in northern Chile. QB2 is expected to be a high-quality, low-cost, long-life operation with significant expansion potential that will substantially increase Teck's copper production and generate considerable value for many years. The project incorporates extensive environmental measures, including the first large-scale use of desalinated seawater for mining in Chile's Tarapacá Region, in place of fresh water use.

A key milestone in advancing Teck's Frontier project was a public hearing in front of a Joint Federal/Provincial Review Panel, which took place from September to December 2018 in Fort McMurray and Calgary, Alberta. This is an important milestone in our efforts to achieve project approval and enhance the overall value of Frontier.

At our Zafrañal copper-gold project in southern Peru, environmental, social and archeological studies were completed as well as ongoing community engagement to support a social and environmental impact assessment. At the San Nicolás copper-zinc project in Zacatecas, Mexico, environmental and

social baseline, preliminary hydrogeological and project engineering studies were advanced in support of a prefeasibility study and preparation of an environmental impact assessment. In addition, a local dialogue house was opened to facilitate and further strengthen community engagement.

In 2018, our Galore Creek project 50:50 partner changed from NOVAGOLD to Newmont. The project team commenced a three- to four-year work program to reinitiate permitting-related activities and to complete an updated prefeasibility study working collaboratively with the Tahltan Nation under the existing participation agreement.

### Significant Environmental Incidents

We assess the severity of environmental incidents based on their potential environmental, safety, community, reputational and financial impacts. Based on our incident severity criteria, there were zero environmental incidents at any of our projects and operations that were considered significant in 2018. For information on our management of water quality in the Elk Valley, [see our website](#).

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### Environmental Litigation

Environmental litigation regarding the Upper Columbia River and involving the Confederated Colville Tribes and the Spokane Tribe of Indians continues. For more information, see pages 116 - 117 of our [2018 Annual Information Form](#).

### Charges, Fines and Penalties

In September 2018, Teck was ordered to pay an Administrative Penalty of \$22,000 in relation to the bypass of a catch basin at Greenhills Operations, while undertaking maintenance on a spillway, which resulted in the death of 83 westslope cutthroat trout in August 2015. Following the incident, the site undertook an investigation that resulted in the implementation of numerous measures to prevent a recurrence.

During the third quarter of 2018, Teck received notice from Canadian federal prosecutors of potential charges under the *Fisheries Act* in connection with discharges of selenium and calcite from steelmaking coal mines in the Elk Valley. Since 2014, compliance limits and site performance objectives for

selenium and other constituents, as well as requirements to address calcite, in surface water throughout the Elk Valley and in the Koocanusa Reservoir have been established under a regional permit issued by the provincial government, which references the Elk Valley Water Quality Plan. If federal charges are laid, potential penalties may include fines as well as orders with respect to operational matters.

## Outlook for Tailings, Waste and Environmental Management

In 2019, we will continue working to improve our environmental performance and continue maintaining the highest standards for tailings, waste and environmental management. As the mining industry reviews and improves best practices for tailings management, Teck will continue to play an active role in collaborating with industry partners. For example, we will collaborate with [TAILLIQ](#), a university/industry research project whose purpose is to help better understand and reduce the risk of mine tailings loss of containment from static liquefaction. Our work with Canada's Oil Sands Innovation Alliance (COSIA) will continue in 2019, with work on both long-term performance and the potential to dewater tailings. We will also continue our engagements with ICMM's and MAC's tailings working groups in 2019 to evaluate how the industry guidance that is developed through these efforts is adopted by the various jurisdictions where Teck operates.

### GRI Indicators and Topic Boundary

306-103, 306-2, G4-MM3

This topic is considered most material by our employees, local communities, government regulators and society in the context of all Teck sites.

### How Does Teck Manage This Topic?

Information about how we manage tailings and mine waste, including relevant policies, management practices and systems is [available for download on our website](#).