

Mining-metallurgical waste management



Responsible, effective handling of the sites where waste from our mining and metallurgical processes is stored, is indispensable for earning and maintaining the trust of our stakeholders and executing our business strategy. Our commitment is to establish a process for responsibly managing these resources based on best engineering and governance practices.

Our commitment is to manage these resources responsibly, incorporating the best engineering and governance practices.

Governance

Our governance defines and documents roles, competencies, responsibilities, and accountability of the governance team responsible for the facility's safety throughout its life cycle—design, construction, operating, maintenance, and oversight. The team is organized into groups:



- I. Site management:** The mine managers that administer tailings storage facilities (TSF) for our operations are the risk owners responsible for operating the facility according to internal rules. The Regional Tailings Manager is responsible for the installation of tailings, while qualified Engineer of Record (EoR) provides the technical experience to guarantee that the facility is managed safely and according to appropriate governance and best practices. Site management and the tailings operations team work together to guarantee safe operation and implementation of our system.
- II. Corporate tailings team:** This is a group of experts who develop and administer corporate governance and controls, including implementation of inspections and external reviews. The deputy CEO of technical services at Baluarte leads the team, with the support of the assistant vice president of infrastructure, as well as corporate tailings specialists and managers.
- III. External reviewers:** Independent experts, inspectors, reviewers, and auditors—who confirm that our requirements for best engineering and governance practices are being met—support our governance framework. Our independent review process includes an Independent Tailings Review Panel (ITRP), dam safety inspections by the EoR, and safety reviews of our dams by external reviewers.
- IV. Group-level oversight:** The Tailings Storage Facilities Review Executive Committee esupervises general governance and operations. This committee—made up of members of senior management—seeks out the advice and assessment of independent experts for a continuous review of operating, governance, inspection, review, and audits. The chief executive officer is the senior executive in charge of tailings management and the development and implementation of the systems necessary for responsibly managing tailings facilities.

Strategy

Strategic implications of mining-metallurgical waste management

Stakeholder trust

Historically, most of the mining industry has responsibly managed tailings storage facilities. While the number of incidents is relatively low, the consequences of a failure can be catastrophic for workers, communities, and the environment. Recent catastrophic failures in Brazil—at Fundão in Mariana and Feijão in Brumadinho—have had severe consequences for the industry's reputation. Of course, extreme consequences for people and the environment resulting from catastrophic failures are unacceptable.

Stakeholders increasingly expect a standard of zero harm to people and the environment. Therefore, responsible management of this type of infrastructure is essential for maintaining the trust of communities, workers, governments, investors, and insurers.

Effective tailings management

Having sufficient storage capacity is essential for the growth and operational continuity of mining and

metallurgical operations. Responsible management of this infrastructure is a complex and multidisciplinary task, requiring the adoption of best engineering practices and governance from the stages of planning, design, construction, operation, maintenance, monitoring, closure, and post-closure. Likewise, the adoption of best social practices requires close community involvement in the facilities' lifecycle.

Management strategy

Our strategy is based on the implementation of currently applicable best practices and available control technologies in engineering, operation, and governance of TSF, as part of our comprehensive tailings management system.

Through continuous development and management, we review and deploy cutting-edge technologies, practices, and methods in our facilities, with the aim of causing zero harm to people and the environment. To achieve this, we adopt best engineering practices and management principles from the Mining Association of Canada (MAC), CDA, ICOLD and ICMM.

Impacts and risks management

We apply the following basic principles to achieve a culture of safe tailings management throughout our facilities' lifecycle:

- I. Accountability, responsibility, and competence:** The associated responsibilities and competencies are defined to support identification and management of the facility's risks.
- II. Planning and resourcing:** The financial and human resources needed to ensure continuous management and governance are kept available throughout the life cycle of the facility and its resources.
- III. Risk management:** Includes the identification of risks associated with the facility, an appropriate system for control, and verification of performance targets. To control risks, we adopted the “critical controls” approach (more information on this approach in the Safety section).
- IV. Change management:** The risks associated with possible changes are evaluated, controlled, and communicated to avoid inadvertently compromising the safety of the facilities.
- V. Emergency preparedness and response:** Processes for recognizing and responding to imminent failures in the facilities and mitigating the impact of a potentially catastrophic failure.
- VI. Review and assurance:** Internal and external processes for review and assurance so the facility's risk controls can be comprehensively evaluated and continuously improved.
- VII. Significant community involvement:** We engage with communities to address their questions and concerns, and conduct visits so they can learn about these infrastructures and responsible operating practices.

Maintaining the highest safety and environmental protection standards for TSF is an ongoing process that requires constant evaluation throughout the facility's lifecycle. Standards for design, construction, monitoring, maintenance, and external review specify the protection of human health and the environment, and establish parameters for closure of mining operations.

TSF engineering focuses on aspects such as the dam liner, downstream seepage interception drainage system,

and surface water diversion. In addition, we have environmental oversight programs aligned with our management and compliance system.

For new projects, we conduct a multi-criteria analysis—also known as multi-account analysis—which considers social, environmental, technical, technological, and economic aspects in our assessment of potential sites for the construction of mining-metallurgical waste storage infrastructure.



Performance and metrics



Governance status

In 2023, we reinforced our commitment to improving safe management of mining-metallurgical waste by successfully applying a TSF governance framework to all of our units and publishing our tailings management policy and tailings guidelines. These documents are essential pillars of our strategy for safe waste management, aligned with industry best practices. We formally incorporated a new engineer of record, adding to the two engineers that joined in 2022. The rest of the sites (11) maintain the designation of Future Engineer of Record.

Progress of impact and risk management

In 2023, we made significant progress in deploying the internal [tailings management system](#), reaching an average completion status of 53%, compared to 36% in 2022. The progress is reflected in the implementation of local governance, the development of the Operation, Maintenance, and Surveillance Manual, as well as the Emergency Preparedness and Response Plan and Potential Failure Modes Analysis; all of which strengthen our capacity to effectively manage and respond to any risk situation. Important progress

has also been made toward the design and construction of new reservoirs or adaptations of existing ones, based on site characterization, the definition of design bases and criteria aligned with the best industry standards, the implementation of quality control and assurance systems, change management, the water management plan, and the tailings disposal plan.

Investments

In 2023, our strategic investments focused on extending existing TSF and developing new facilities to ensure operational continuity. Fifteen projects are now in place, with an overall investment of US\$191.8 million. Among the largest projects are those at key units such as Capela, Sabinas, and Velardeña.

Inventory of facilities

The inventory of mining-metallurgical waste storage facilities and water dams was updated in 2023. Thirty-four were recorded as inactive or under care and maintenance and 12 as in active operation.

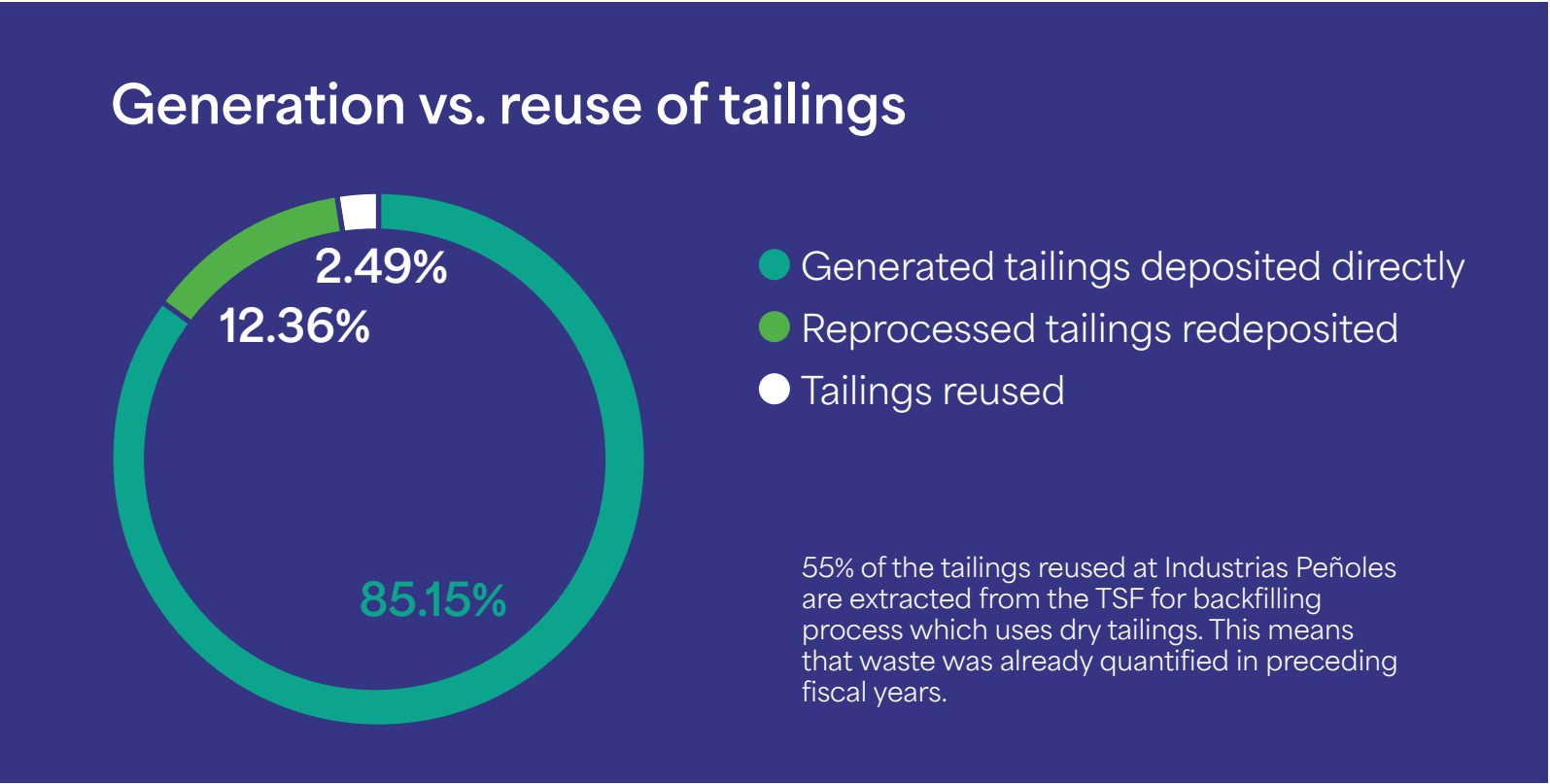
We continued to closely monitor the amounts of tailings deposited at our facilities to determine their capacity and remaining useful life. In 2023, we generated **19.35 million metric tons** of tailings, **2.33 million** of which were used

in mine backfilling processes while the rest were stored in our TSF. We also deposited **23.01 million metric tons of ore** at our leaching pads and generated **1.21 million metric tons** of other mining-metallurgical waste other than jarosite, which were stored at safe facilities as part of our tailings management system.



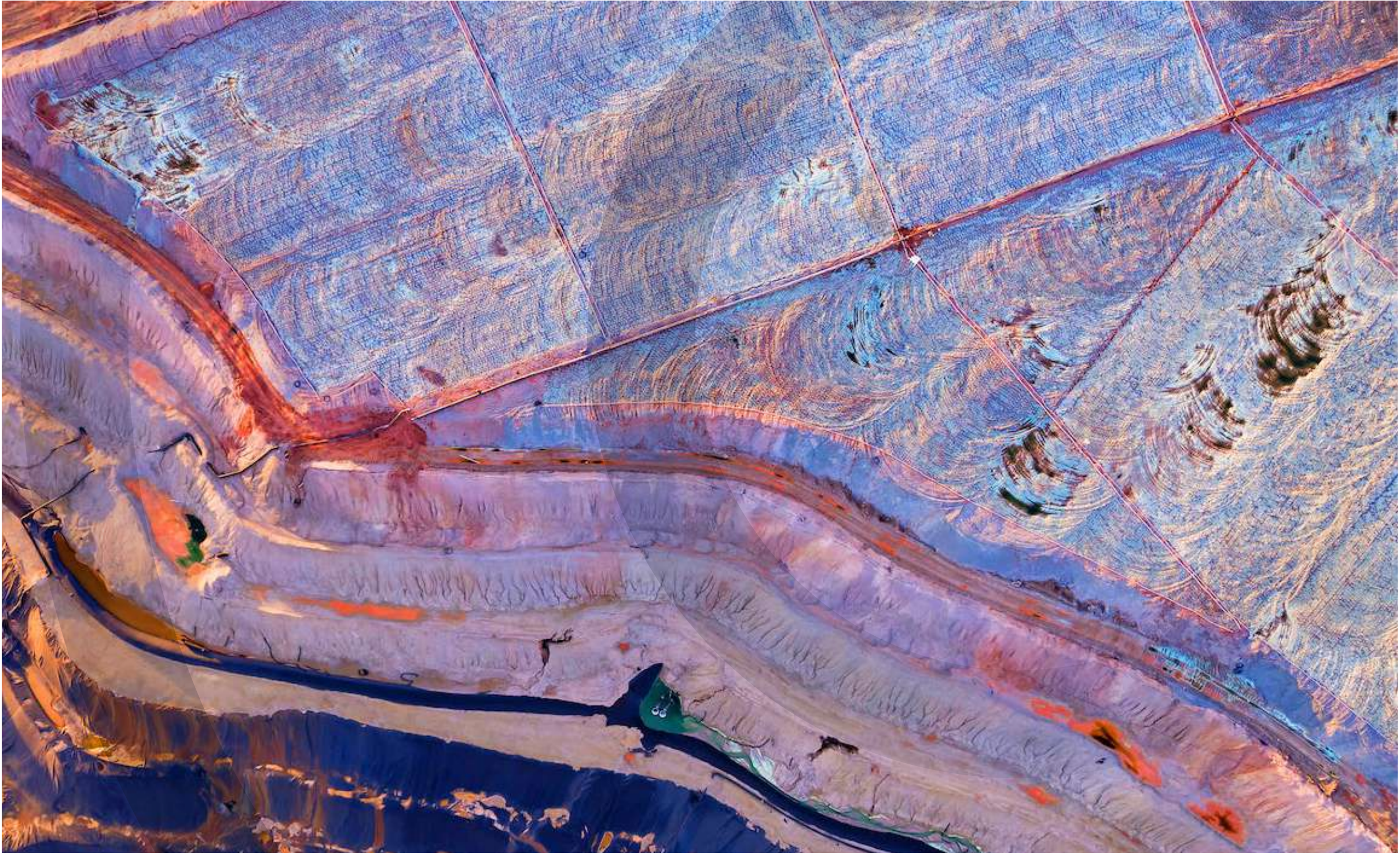
Generation of mining-metallurgical waste (t)

Division	2023	
	Tailings	Waste rock
Peñoles Mines	4,857,298.47	5,209,190.40
Fresnillo plc Mines	14,500,469.51	88,241,009.77
Industrias Peñoles	19,357,767.98	93,450,200.17



Disposal in leaching pads (t)

Division	2019	2020	2021	2022	2023
Peñoles Mines	2,473,965.00	694,219.00	-	894,745.00	1,806,596.00
Fresnillo plc Mines	34,422,898.00	20,570,573.00	28,641,642.00	29,345,382.00	21,208,753.00
Industrias Peñoles	36,896,863.00	21,264,792.00	28,641,642.00	30,240,127.00	23,015,349.00



Our heap leaching facilities management is crucial because it helps us monitor the processes of care, maintenance, and closure at the point when processed leachates are considered mining-metallurgical waste.

During 2023, we successfully implemented the governance framework for tailings storage facilities—reinforcing our commitment to improve safety in mining and metallurgical waste management.

Case study - Technology in instrumentation and monitoring systems

We made technological improvements in the instrumentation and monitoring systems used at the San Julián, Herradura, Sabinas, Tizapa, and Capela TSF, and work is underway to incorporate them at other units. These improvements include robotic stations for the automatic measurement of prisms and topographic controls in the main geotechnical structures of the deposits, as well as the remote, continuous, and automatic measurement of vibrating wire piezometers. As a result, we enhance the reliability and timeliness of our measurement of instrumentation data from the facilities.



Currently, Sabinas’ tailings storage facility operates under stable conditions with instrumentation and real-time monitoring.

Case study - Compliance with CDA criteria

In early 2023, the Cienega 3 tailings storage facility achieved compliance with the safety factors established by the Canadian Dam Association (CDA) for ensuring slope stability. This significant compliance was achieved by building a reinforcement to the main embankment, which was design based on field investigations of the original construction. The deposit is now operating in line with international standards and is ready for possible growth to serve the mine for its remaining life.

Case study - Sabinas tailings storage facility

Following the eighth expansion of the Sabinas tailings storage facility number 4—completed in early 2019—there were concerns about its stability, and it ceased operations in November 2019. A geotechnical investigation was conducted, confirming the risk to the stability of the main embankment. A reinforcement had to be designed and built to achieve static and dynamic stability. This reinforcement was completed in 2023, which allowed for an elevation that would cover a further two years of operation. In 2024, further analysis will be carried out to design an additional raise, which will create capacity for approximately 2.5 more years. Currently, this facility operates under stable conditions and has instrumentation and real-time monitoring, as well as documents and procedures that guarantee the safety of its operation aligned with its tailings management system.

